APR 20 1945

Insure VICTORY .... Buy Bonds for War .... Push Plans for Peace

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Contractors and Engineers Monthly

Vol. 42, No. 4 APRIL, 1945 $3 a Year, 25 Cents a Copy

Be Sure to Read

County Road Work
Such varied county highway department activities as bituminous patching of roads, center striping, and weed killing in Alameda County, Calif., are described in detail in an article starting on this page. In Monroe County, N. Y., the towns play an important part in county road maintenance. For a typical town set-up, see page 21. A feature of the Chase County, Kansas, Highway Department's activities has been the repair of flood-damaged bridges. This and other work are described on page 57.

Airport Grading
Grading for six runways and the central area at the 4,057-acre New York City Municipal Airport at Idlewild, L. I., involved 2,400,000 cubic yards. The planning and equipment used in this work are covered in a story starting on this page.

Flood Wall Repaired
One of the jobs of the New York State Department of Public Works is the maintenance and repair of the concrete flood walls along the Genesee River in Rochester. The procedure and equipment used are described on page 2.

Roadside Memorials
Roadside parks, waysides, and turnouts make appropriate war memorials. How to select the sites and plan their design and use to provide the utmost in commemoration, in beauty, and in service to the traveling public is illustrated and discussed in an article on page 6.

Highway Maintenance
More and more emphasis must be placed on the maintenance of highways to keep traffic moving for the duration. How Wyoming meets its varied maintenance problems is told on page 11. The use of shallow concrete patches for concrete pavements in New Jersey is described on page 50. Indiana is awarding contracts for various "clean-up" jobs such as bridge repair, channel clearance, correction of unsafe sections of rock cuts, etc. See page 52.

Road Construction
Although greatly curtailed, essential road construction still goes on. The contract for 12.8 miles of 150-pound bituminous mat in southern Minnesota, involving a 13-mile dead haul of the gravel, is described on page 15. Wisconsin's use of air-entraining cement to avoid the damaging effects of chlorides in ice control on a concrete highway in South Milwaukee is described on page 73. A short section of important county road in Sangamon County, Ill., was reconstructed last autumn by contract, involving a new stone base and cold-laid bituminous top. See page 85.

Steel-Girder Bridge
Among the sixty-one structures on the Detroit Industrial Expressway in Michigan is a 156-foot steel-girder skew span carrying eight railroad tracks over the Expressway.

(You will find "In This Issue" on page 4)

C. & E. M. Photo
The Tournapulls at Idlewild loaded at 3 mph and hustled their loads to the runway and administration-area fill at 15 mph.

Planned Grading For N. Y. Airport

Systematic Moving of Sand At Idlewild; Pulled and Self-Powered Scrapers Aid In Rapid Completion

✦ THE earth is flying at the New York City Municipal Airport at Idlewild, Borough of Queens, as huge stockpiles of dredged sand fill are being moved to form runway foundations for what will be the world's largest airport. The 4,057-acre site, located along the marshy lands bordering Jamaica Bay on the south shore of Long Island, has been covered with a thick mat of fine sand pumped by hydraulic dredges from the

(Continued on page 18)

Patching Bituminous Roads, Striping, and Weed Killing

By FRANK B. SARLES,
Western Field Editor

Alameda County, California, Has Novel Equipment for Large and Small Patches and Other Operations

✦ LOCATED on the eastern side of San Francisco Bay, Alameda County in California has a well organized program of highway preventive maintenance based on the old proverb about a "stitch in time". To carry on this program, the County uses a combination of two units, designed and built in the county shops at Niles, which make possible the repair of a considerable mileage of bituminous-surfaced roads with maximum economy and minimum man-power. Approximately 70 per cent of the 550 miles of county roads has a 1-inch bituminous armor coat on a gravel or crushed-stone base from 5 to 8 inches thick, while the remaining 30 per cent consists mainly of gravel-surfaced mountain roads.

The principal maintenance operation, particularly at the present time, is the placing of an additional thickness of armor coat over existing surfaces. This work is done as soon as the bituminous surface shows signs of porosity, an attempt being made to repair incipient damage rather than wait until it has become critical.

Aggregates for Bases

Under wartime limitations, little work is being done on existing bases, although this was an integral part of pre-war maintenance. For the purpose, a pit-run gravel is used in the southern and eastern parts of the county where it is readily available. The gravel is usually purchased from commercial producers under a specification limiting the maximum size to 2 inches and the linear shrinkage of the binder to not more than 6 per cent. From 50 to 75 per cent of this pit-run gravel is retained on a No. 4 sieve.

Gravel so purchased is hauled by county-owned trucks and spread and compacted by county forces. Motor graders are used for spreading and mixing. Large quantities of water, the amount dependent on air and aggregate dryness, are added by using 1,000-gallon water tanks mounted on 1½-ton Chevrolet truck chassis. Each of the water tanks is fitted with a 2-inch Roper gear pump driven by a power take-off attached to the transmission, with controls located in the driver's cab. The pumps are used for loading and discharging, and a gravity system is attached to the rear of each tank for wetting the roadway through sprinkler heads operated by the driver. Sufficient water is added to form a very plastic mixture which is bladed and shaped to proper cross section and rolled by 12-ton 3-wheel rollers, a Huber and an Austin-Western. Bases 5 inches or less in thickness are placed in one course while thicker bases are placed in 4-inch layers.

In the west central part of the county, where gravel is not readily available, a similar procedure is followed with crushed rock, also secured from commercial producers. In isolated cases and for small quantities, the County has

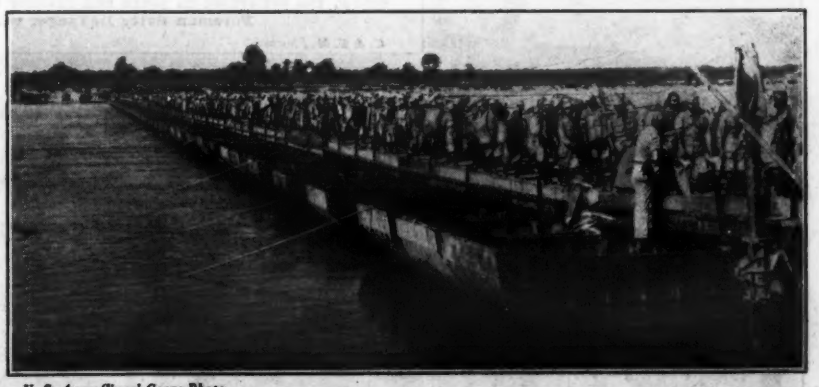
(Continued on page 81)

H. R. 2030 Threatens Competitive Bids

✦ THERE has been recently introduced in Congress a bill, H. R. 2030, which would substitute a new combination of negotiated and management form of contracts for competitive bidding on highway projects and other Federal public works. The bill purports to protect the Government from profiteering and to remove the causes of unfair trade practices in public construction. It would set up a "Construction Contract Ratifying Committee", consisting of three members to be appointed by the President, which would have final authority over the approval of all construction contracts entered into by the Government or any Federal agency. The committee would also have authority to renegotiate contracts.

The operation of any such law would discourage, if not destroy, private initiative, and consequently private enterprise, in the field of public construction. Such a scheme ignores the advantages of competitive bidding which form the very basis of economic operation in the construction industry. There may be a place for negotiated contracts during periods of war and some excuse for renegotiation when normal economic balances no longer exist. But this bill is directed towards the post-war construction program and there is no justification whatsoever for throttling the industry with such legislation during the period when the very future of our country depends upon the development and

(Continued on page 28)



U. S. Army Signal Corps Photo
Said to be the longest pontoon bridge of this war, U. S. Army Engineers built this 1,200-foot bridge across the Irrawaddy River in Burma. Sixty men completed the job in 14 hour and 45 minutes. In this view, Chinese troops are moving up to reinforce Allied forces pushing deeper into northern Burma.

Method of Repairing Concrete Flood Wall Along Genesee River

Procedure and Equipment Used by Maintenance Crew Of State Public Works Dept. In Rochester, N. Y.

By WILLIAM H. QUIRK,
Eastern Field Editor

✦ CONCRETE retaining walls along the Genesee River at Rochester, N. Y., which is part of the New York State Barge Canal system, are being reconstructed because of serious disintegration below the water line. This work has been carried on for the past five years by Division of Canals and Waterways maintenance crews of the New York State Department of Public Works. An elaborate system of surveying, building watertight cofferdams, and bonding the new concrete with the sound parts of the walls are features of this repair work. During 1944, nine sections of wall, each 40 feet long, were reconstructed, making a total of forty-four sections, or 1,760 feet of wall, which have been rebuilt since 1940.

The Genesee River at this point serves as a spur of the Barge Canal which cuts across New York State in an east-west direction, linking Lake Erie at Buffalo with the Hudson River north of Albany. This 3-mile stretch of the Genesee running north and south ties in the downtown industrial section of Rochester with the main canal which borders the southerly limits of the city. The two water arteries meet in Genesee Valley Park. From here the Genesee flows northward and empties into Lake Ontario but the river is navigable only for the 3-mile passage to the Court Street dam in downtown Rochester. From a pool elevation of 513 at this point the Genesee drops 269 feet in a series of falls and rapids through a 7-mile gorge, rushing northward to Lake Ontario which is at elevation 244.

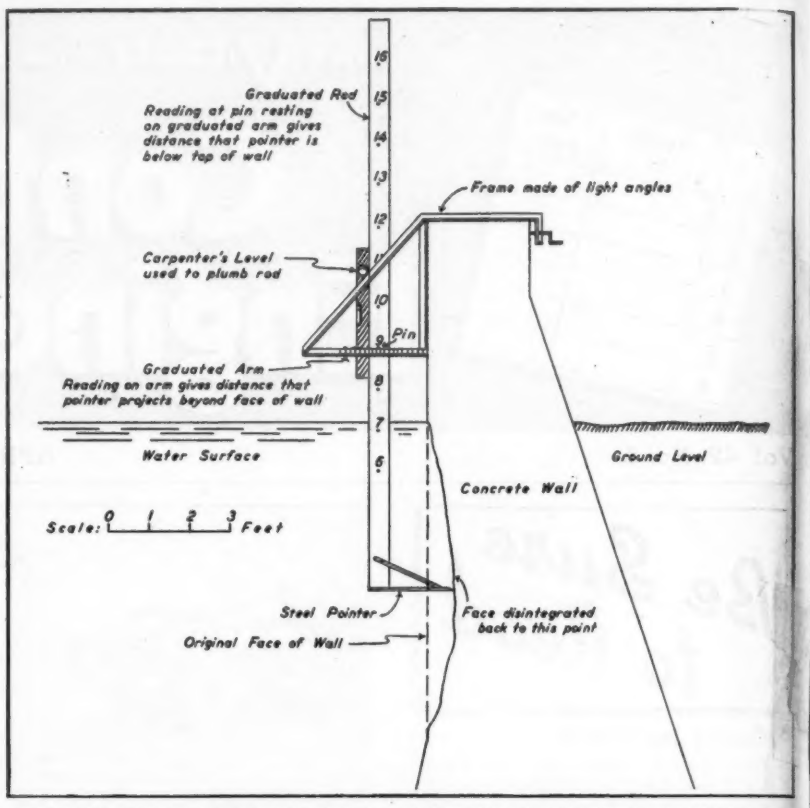
For a distance of 1½ miles south of the Court Street dam, the 450-foot width of the Genesee is bordered by concrete retaining walls which form Rochester harbor. On the east bank of the river the ground elevation is 5 feet above pool elevation; but on the west side the river is 3 feet higher than the land. Here can be realized the importance of this restraining dike of concrete, and the serious flooding that could result in downtown Rochester should these river walls not be maintained in perfect condition. In this area the river varies from 12 to 20 feet in depth, with the wall extending 5 feet above pool elevation. The top of the wall is 2½ feet wide and the height varies with the depth of the river. The walls slope down to a footing 13 feet wide and 2 feet 9 inches thick which rests on rock. These walls were built from 1917 to 1919 with bank-run gravel as aggregate. This old concrete has tested as high as 11 to 14 per cent water content due to porosity as against the 3 to 4 per cent of that now going into the rebuilt sections. In order to provide for the spring run-off, the pool level in the river is lowered 5 feet during the latter part of each winter. The concrete in the walls thus exposed is subjected to freezing action and had disintegrated to a serious degree at many points along the wall.

Surveys and Equipment

The 5-foot face of wall visible above the surface of the water was in fairly good shape and at times belied the condition below. To ascertain the amount and location of disintegration in the face of the concrete walls, the State engineers developed a unique device which measures the extent of the damage. A crew of three is required to operate this device; one man on the wall, and two working from a rowboat. A frame made of light angle iron is slipped over the top of the wall and fastened on the rear with a hand-crank screw. On the water or front face of the wall a triangular extension of the top frame supports a 2 x 6-inch x 16-foot rod to which is attached a carpenter's level. The horizontal base of the triangular frame parallels the surface of the water and has a graduated arm. The long rod is also graduated so that readings at a pin set in the graduated arm can be taken. At the bottom of the rod is a steel pointer which probes the face of the wall below the surface and records how deep is the extent of the disintegration. Readings in tenths of a foot are taken on the graduated arm and give the distance that the pointer projects behind the normal face of the wall. At the same time, a reading is taken on the rod which gives the distance, in feet, that the pointer is below the top of the wall. The carpenter's level is used to keep the rod plumb. This ingenious gage is manipulated by the man on top of the wall; readings are taken by one of the men in the boat while the other handles the oars and checks the readings.

Profiles are thus taken along the face of the walls at 25-foot intervals and the results plotted on cross-section paper. Based on these surveys, the wall sections in greatest need of repair are worked on first. Disintegration has not been constant; some sections showed little damage while others had gouges 8 feet high and 4 to 12 inches deep extending the length of the section.

(*Continued on page 42*)


Graduated Rod
Reading at pin resting on graduated arm gives distance that pointer is below top of wall
Frame made of light angles
Carpenter's Level used to plumb rod
Pin
Graduated Arm
Reading on arm gives distance that pointer projects beyond face of wall
Water Surface
Ground Level
Concrete Wall
Scale: 0 1 2 3 Feet
Steel Pointer
Face disintegrated back to this point
Original Face of Wall

The device used to measure the extent of disintegration that has taken place below the surface on the concrete walls along the Genesee River in Rochester, N. Y.

The New Ledo Road, An American Project

Engineer Troops Build 465 Miles Through Jungle and Mountains at Rate of One Mile Daily; Culverts, Bridges

✦ TO American Engineer Corps officers and colored engineer troops goes the credit for the speedy completion of the Ledo Road connecting Ledo, Assam, India, with the Burma Road at Mong Yu, Burma, a distance of 465 miles. Pushing the last 420 miles of this strategic highway, which is proving the life line of military supplies from Calcutta for China, through jungle, swamp, mountain, and valley, at the rate of a mile a day, construction troops were bedeviled by monsoons, floods, and Nips, but they got through and the first convoys from Ledo have already made the long run to Mong Yu in Burma, Wanting in China, and on to Kunming.

This road has been constructed at the end of the longest supply line in the world, with too few troops and never enough equipment from the very outset of the project. There were neither records nor means of securing information on the topography, types of soil, road materials, amounts of rain, or the characteristics of the rivers that were to be encountered, and the jungles through which the road passes were too thick to permit more than a rough location of the route to be followed.

Work was started on the Ledo Road in December, 1942, but the initial progress was slow. When Brigadier General Lewis A. Pick assumed command of the construction of the road in October, 1943, the lead bulldozers crashed into the jungle at the 45-mile mark, with the construction troops following and, after fifteen months of around-the-clock grinding through jungles, mud, and monsoon rains, today there stands the highway.

Strategic Importance

Probably never before in military history have operations required such dovetailing of interests as in the building of the Ledo Road. Unless the Japs were cleared out, the road could not have progressed, and without the road, the combat troops could not have pushed back the enemy. Only the first 42 miles of construction was through friendly terrain. With the crossing into Burma in March, 1943, the life line entered enemy-held territory and from then on its soldier-builders were subjected to Jap ambushes, artillery fire, land mines, bombing, strafing, and sniping.

Moving closely behind the combat troops, the road was the thin thread that supplied our fighting forces as they routed the determined Nips from bunkers and entrenchments, occupied for more than two years. Lead bulldozers were armor-plated and at times engineering soldiers went ahead of the combat men to clear trails so that American and Chinese troops could reach the dug-in Japs. The road made possible the movement of tanks and heavy artillery pieces and, as the project progressed, it was possible to build and supply new air strips to give active aerial support to our ground troops.

In addition to the main highway, several hundred miles of combat roads, pack trails, temporary supply roads and access roads were built. From Shingbwiyang, Burma, a combat road was bulldozed out of the jungle to open a route for Merrill's Marauders in their famous drive to Myitkyina. Simultaneously with this effort, the main Ledo

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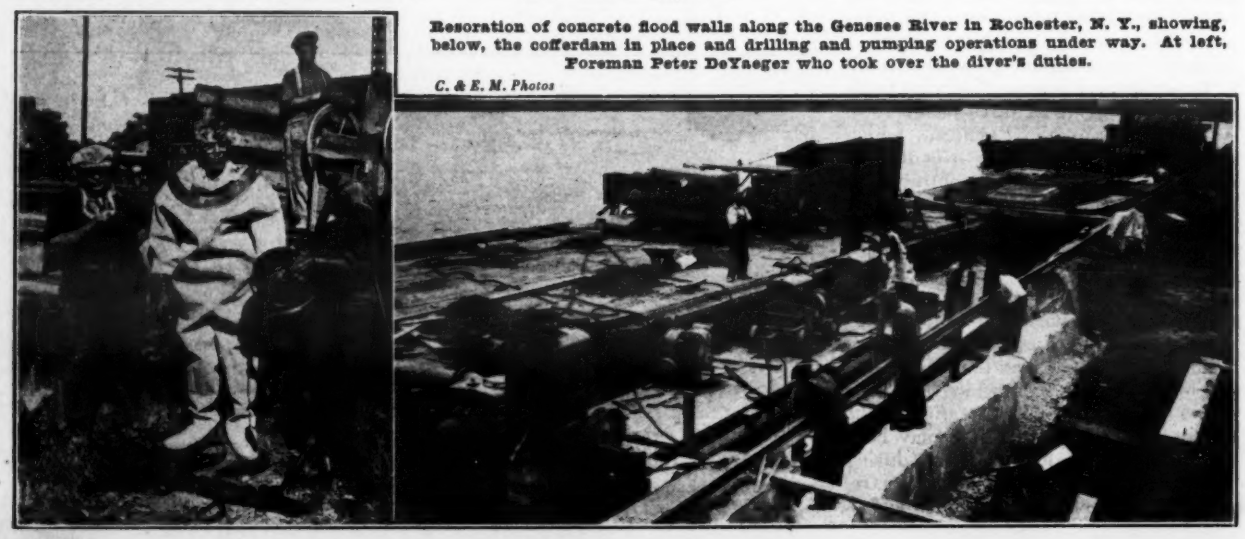

Resoration of concrete flood walls along the Genesee River in Rochester, N. Y., showing, below, the cofferdam in place and drilling and pumping operations under way. At left, Foreman Peter DeYaeger who took over the diver's duties.

C. & E. M. Photos

This 18-mile Texaco Sand-Asphalt pavement on Route 33, Virginia, was laid in 1941 on an old sand-clay surface.

As evidence that good roads need not be high-priced roads, take this 18-mile Texaco Asphalt pavement on Route 33 in Virginia. When laid four years ago, the pavement was not given a new foundation. Instead, it was placed directly over the existing sand-clay surface.

Furthermore, instead of employing expensive aggregate in the plant-mixed Texaco surface, Virginia engineers used low-cost locally available pit-run gravel, from which particles larger than 3/8-inch were removed.

Smooth and easy-riding as when laid in 1941, this economical Texaco Sand-Asphalt pavement has required practically no maintenance to date.

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Contractors and Engineers Monthly

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Highway Standards for the Future

Progress in highway design has come about largely from the demands of highway users. The first phase of development was passed years ago when we found out that horse-and-buggy roads were not suitable for automobile traffic of any magnitude. During the last decade, we have come to realize that other things in addition to a paved surface are necessary for safe and efficient motor transportation. No longer can we follow the policy of narrow pavements and shoulders, twisting alignments and steep grades, deep ditches, barren slopes, bridges at right-angle turns. Such standards very definitely belong to yesterday.

Today's design must provide a surface width to meet the requirements of wide, heavy trucks and buses; alignments and grades must satisfy modern high speeds; shoulders must permit off-road parking; features tending to high winter-maintenance costs must be avoided. And beyond this, today's roads and bridges must be built for future traffic growth rather than just to meet present conditions, so that they will not become obsolete after a very few years.

The enormously increased weight and speed of all motor vehicles, especially trucks and buses, are reflected in the present standards for bridges. So far as width is concerned, the latest Federal requirement is that the roadway on a bridge must be 6 feet greater than the width of the pavement approaching each end. The strength requirement for bridges now involves exceedingly complicated computations, which add considerably to the time and cost of designing.

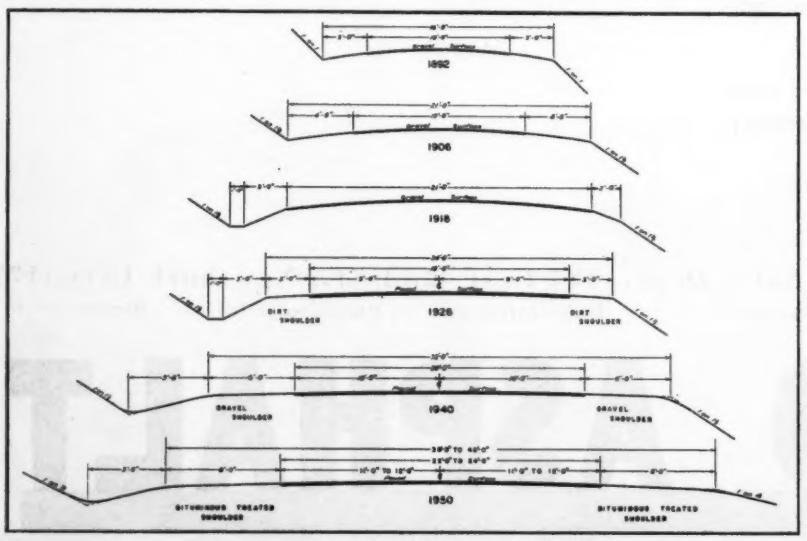
Sight distance, that is, how far a driver can see along the road ahead, once was considered adequate enough at a few hundred feet. A major source of hazard on our older highways, therefore, is congestion. A slow-moving vehicle collects a string of cars behind it on blind hills or winding roads, and always there is an impatient driver ready to pull out and take chances. With present vehicle speeds, highway sight distances must be increased for safety to about 1,000 feet.

Experience has demonstrated that guard rail can be eliminated safely by using fairly flat cut and fill slopes. Moreover, such flat slopes will encourage natural vegetative growth. The promotion of vegetation on raw construction areas, by seeding, sodding, or planting as necessary, results in a marked reduction of maintenance costs through preventing erosion. The improved appearance of the roadsides follows as a consequence of present-day design methods.

These improvements, and many others, in highway design naturally require a greater initial cost. Wider roads, straighter lines, and easier grades mean more cutting and filling, deeper subbase, longer culverts, increased right-of-way purchases. Where ten years ago it was possible to build a highway for thirty or forty thousand dollars a mile, the same project, according to present standards, would cost two or three times as much. This added initial expenditure, however, is economically justified by reducing maintenance and by prolonging the usefulness and life of the highway.

This editorial is a statement of policy published on pages 17 and 18 of the Twelfth Biennial Report of the State Highway Board of Vermont which is to be congratulated on this clear, concise statement of the highway needs of the future.

Federal taxes paid by highway users in 1944 amounted to $627,640,407, as compared with $509,029,862 in 1943. The gas tax amounted to $328,597,298.



Vermont's highway standards—past and future.

Book on Contracts And Specifications

A new book on "Engineering Contracts and Specifications", which presents in compact form some of the legal and business aspects of the engineering profession, has been written by Robert W. Abbett, Assistant Professor of Civil Engineering at Columbia University, who had a wide background in the structural engineering field prior to his career in teaching. Following a general introduction, the chapters take up successively legal considerations, with discussion of various acts affecting construction; types of construction contracts; bidding procedure; competitive-bid contracts; cost-plus-a-fixed-fee contracts; surety bonds, prequalification, arbitration, and settlement of claims; contracts for engineering and architectural services; and a final chapter on specification writing. The book ends with a 2-page bibliography and 3½ pages of index.

"Engineering Contracts and Specifications" is published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., and sells for $2.25.

Post-War Employment Involves Basic Issue

A fundamental philosophy of government is involved in the problem of whether or not the Federal government is to guarantee to each individual willing and able to work the right to have a job, according to a provocative article in the March issue of *The Constructor*, official publication of the Associated General Contractors of America.

There are two schools of thought on this controversial issue, which must soon be decided by the people of the nation. One school advocates that the Government assume the responsibility to assure each individual the right and opportunity to hold a useful and remunerative job. The other contends that this proposal, no matter how carefully administered by the Government to stimulate private enterprise and employment through private enterprise, means governmental control of the entire national economy, and eventual loss of individual freedom.

The article states: "There is agreement between responsible elements of both groups that the aim of the national government should be a continuing high level of employment and that there should be opportunities for work available to everyone willing and able to work. The disagreement is over the methods of how it shall be attained".

It is pointed out that the construction industry is directly involved for two reasons: first, because it is expected to be the initial major industry to provide a large volume of employment after the war or as soon before that time as conditions permit; and, secondly, because practically all proposals for stabilizing a high level of employment contemplate expanding the volume of public works when other employment decreases.

In general, business favors trying to provide this continuing high level of employment through a free economy by intelligent planning for the future, the article states, adding, "It is becoming increasingly clear that unless business can convince the public that without governmental control the nation can maintain full employment, the people will demand governmental controls which promise this goal".

"The candidates for both political parties stressed the fact that there must be a high level of employment after the war", the article says. "The President referred to 60,000,000 jobs. Governor Dewey said, 'If at any time there are not sufficient jobs in private employment to go around, the government can and must create job opportunities'.

"Next to the war," the article continues, "jobs and business opportunities are the greatest concern of the people of the country. The decision of how a high degree of employment is to be achieved is the most important domestic issue before the nation. The decision could change the fundamental philosophy of the government, and our history. Construction is directly involved. If the decision is postponed to give private enterprise the chance to prove whether or not it can solve the future employment problems, a tremendous burden will be placed on construction, because it will be the first major industry to swing into peacetime production and large-scale employment.

"Construction could provide the test of whether or not our present form of economy survives."

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Booklet on Stabilization Of Construction Industry

One of the most important steps in balancing the national economy at full-employment levels after the war will be stabilizing the construction industry, according to a report recently made public by the National Planning Association. This report, entitled "Stabilizing the Construction Industry", was prepared by Miles Colean, well known construction authority, in close consultation with members of the Agriculture, Business, and Labor Committees of the Association.

The Colean report estimates, as a working basis, that the annual volume of construction appropriate to a general high employment for the first post-war decade will be not less than $15,400,000,000 for all types of new construction and $21,000,000,000 for all construction, including maintenance. The statement of the committees, principles and procedures, and specific recommendations for immediate action in a stabilization program are included in this 40-page pamphlet which is divided in four main parts: Developing a Stabilization Policy; Instruments of Stabilization; Initial Steps in a Stabilization Program; and The Operation of a Program.

Copies of this booklet, which is No. 41 in a series of Planning Pamphlets issued by the National Planning Association, may be secured direct from the Association, 800 21st St., N. W., Washington 6, D. C. Price: 25 cents.

Tire Threats Removed

Before snow and frozen road surfaces halted its operations this winter, the Minnesota Department of Highways' road magnet had covered 550 miles of highways and collected 2,580 pounds of nails, wire, scrap metal, and similar tire threats. Averaging 100 pieces per pound, this haul removed over 250,000 pieces which might have injured tires and forced them out of circulation and on the scrap heap.

C. L. Motl, Minnesota's Maintenance Engineer, reports that this important highway service was given at a cost of approximately $1.00 a mile, which covers all expenses involved in the operation, including depreciation.

What's your highway and airfield construction PROBLEM

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☐ Preparing — in one tractor trip — a perfect seed-bed for grass or any planting.

☐ Faster, more economical, more thorough in place mixing of road materials.

☐ Aeration of aggregate; — of bituminous mix; or to dry out a deep muddy field condition.

☐ Pulverization of scarified, old bituminous material to reduce to original aggregate size for re-mixing.

☐ Quicker, more economical bituminous stock-pile mixing.

☐ Doubling yardage in widening shoulders using existing shoulder aggregate.

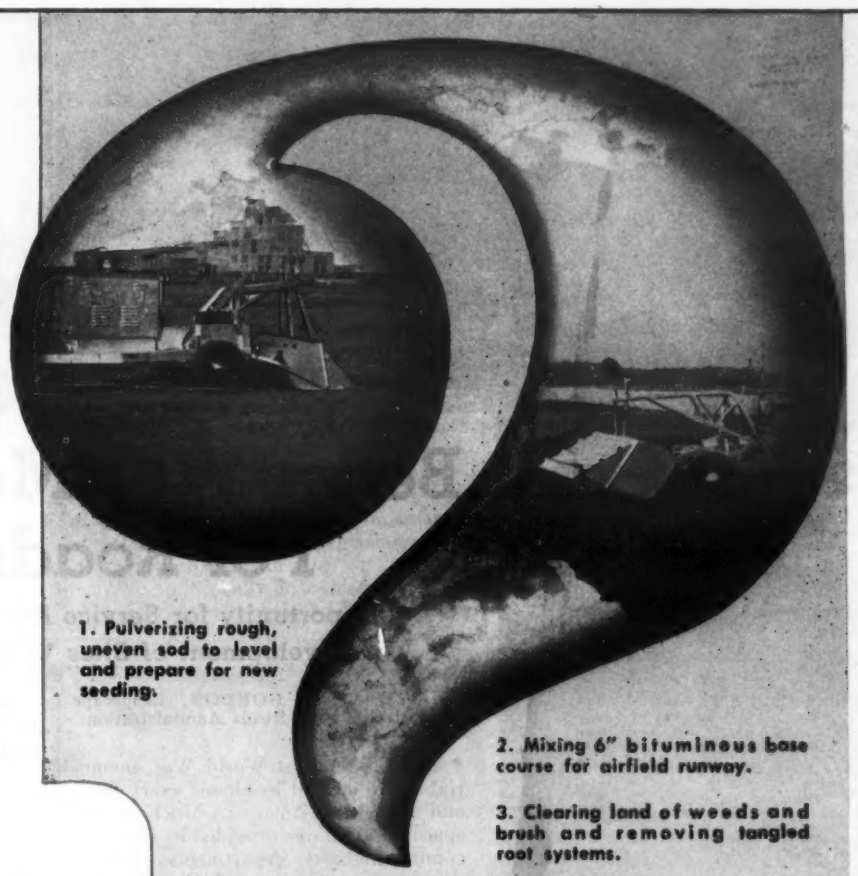
☐ Bituminous highway or runway maintenance.

☐ Pulverizing hard, frozen snow drifts.

☐ Removing ice from runways, streets, highways.

☐ Roadside mulching.

☐ Pulverization of soils prior to compaction in earth work.

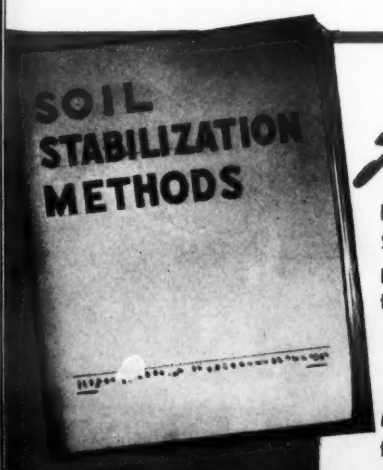


1. Pulverizing rough, uneven sod to level and prepare for new seeding.

2. Mixing 6" bituminous base course for airfield runway.

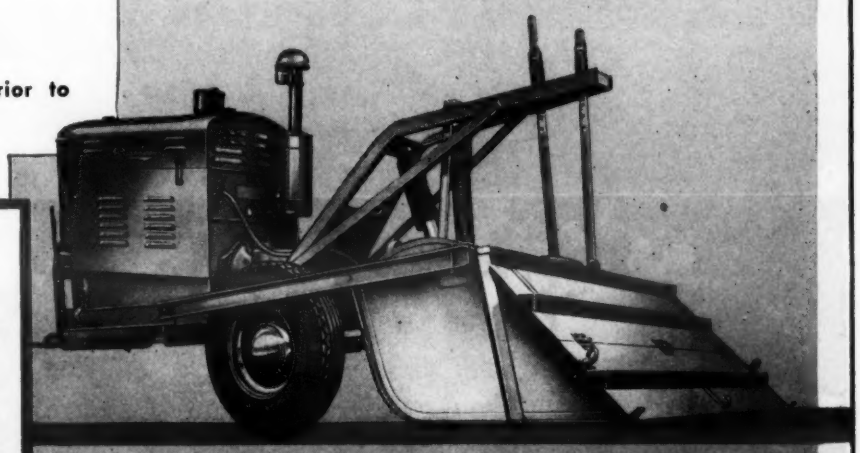
3. Clearing land of weeds and brush and removing tangled root systems.

Highway and airfield engineers cite the SEAMAN PULVI-MIXER as the most comprehensive and useful equipment ever developed. A study of its astonishingly wide range of uses will be of profit to engineers, contractors and those directly concerned with airfield maintenance.



THE *Answer*

In this profusely illustrated book, Soil Stabilization Methods, compiled by Seaman engineers, will be found a description of modern practices in this field — and a detailed account of many uses for the SEAMAN MIXER. Write for your copy. Ask for Bulletin E-24.



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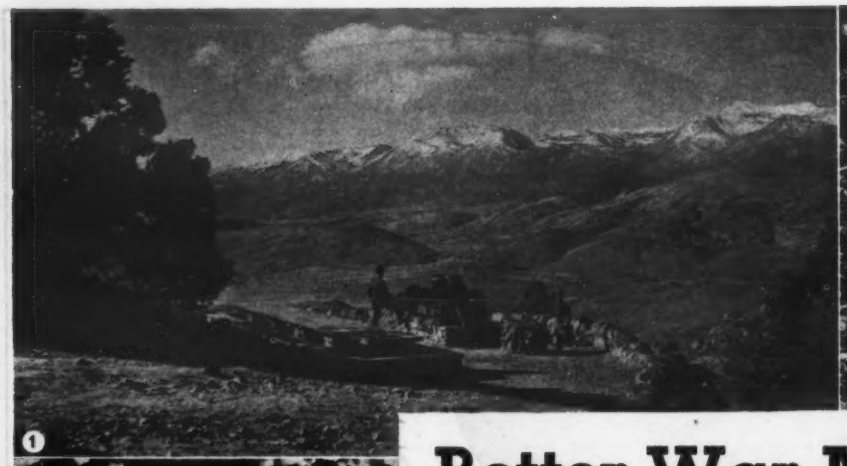
SEAMAN MOTORS

Milwaukee 3, Wisconsin

C-145



Better War Memorials For Roadside Areas

An Opportunity for Service Awaits Highway Engineers In Development of Sites With Civic Significance

By GEORGE B. GORDON, Landscape Architect, Public Roads Administration

✦ AFTER the first World War, memorials were erected in almost every town and village of America. Much of the space required was provided by state and county highway departments. Bronze doughboys and captured German cannons and tanks appeared in traffic circles and islands, and in other places near the intersections of streets and main highways. Some of these memorials were pretty bad, and some were eyesores but, once in place, public opinion resists the disturbance of any kind of memorial. There they stand today, and there they will remain until time, the elements, or an unlikely earthquake disposes of them.

What can highway officials do about the new war-memorial movement already gaining headway from coast to coast? How can members of highway organizations guide public opinion towards better war memorials of which we may all be proud, and which our returning service men will approve as worthy of their purpose?

War memorials in the form of traditional columns, shafts, and statuary, and the civic architecture in our cities and towns, are of little or no direct concern to highway officials. Even discussion of fine memorial highways, and memorial bridges, may require more space than is here available. The thought occurs, however, that highway officials will be most

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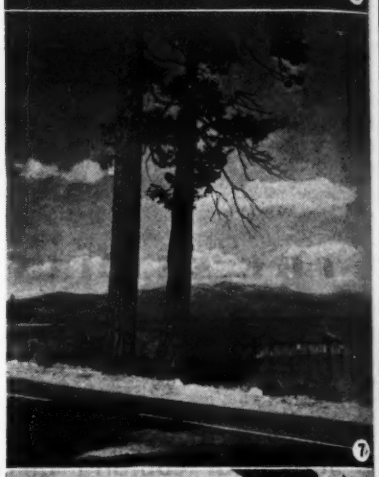
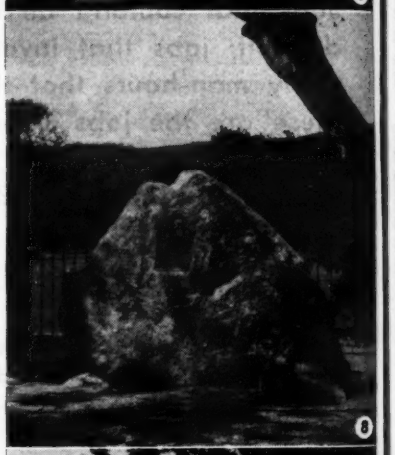
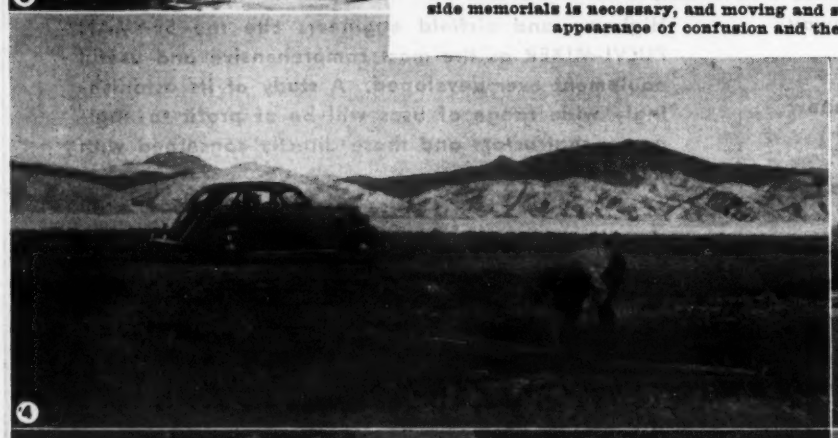
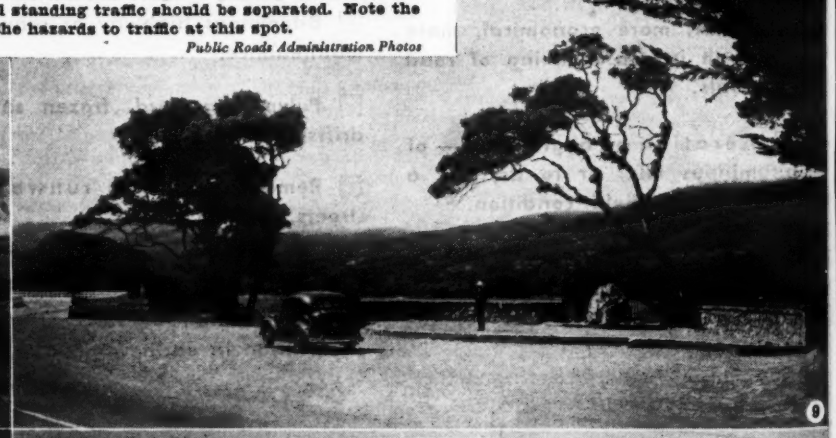




1. A fine site for a memorial in Nevada, but the stone work is not of memorial calibre. 2. The first memorial to an "unknown soldier" in America is this tablet to British soldiers, on a fence corner at the site of the Battle of Lexington. A roadside memorial need not be complicated in design nor costly to be effective. 3. Waysides, such as this one in Connecticut, provide settings for roadside memorials, but the service areas should be separated from the "place of honor" by suitable screen planting. 4. A grove of cottonwood trees might form the background of a wayside war memorial in the form of a sunken well curb of weathered native stone at a flowing spring in desert country. 5. This valley in California among massive cliffs and boulders would provide an excellent location for a roadside war memorial. 6. There is no better setting for a roadside memorial than among fine old trees, such as this grove of original white pines in Maine. 7. A lake shore is one of the best of wayside sites. 8 and 9. The detail and layout of a memorial turnout in California. Good stone work is the hallmark of professional design, but the effectiveness of this site lies even more in the magnificent view. 10. Professional design of parking areas at roadside memorials is necessary, and moving and standing traffic should be separated. Note the appearance of confusion and the hazards to traffic at this spot.

Public Roads Administration Photos





Portraits in Print

By BILL QUIRK

Arthur A. Johnson, N. Y. Contractor, Makes Career in Heavy Construction

ENGLAND'S gift to the construction industry of this country, when Arthur A. Johnson came here over forty years ago to dig under-water tunnels, has been increased with every new public, private, or military work that has taken form over the years through the building skill of one of the great engineering and contracting firms of America, The Arthur A. Johnson Corp. of Long Island City, New York. In 1904, Mr. Johnson, then only 25, landed in New York to begin work as a General Superintendent for S. Pearson & Son, Ltd., of England, which company had a contract with the Pennsylvania Railroad for the construction of four tunnels under the East River.

"It now may appear odd that America had to go to England for a contracting firm to build tunnels," commented Mr. Johnson with a faint smile as he slowly puffed on his pipe, "but the fact was that contractors in this country had had very little experience in constructing subaqueous tunnels. The great era of tunnel construction was just beginning in New York City around 1904. Since then, of course, American contractors have made such tremendous strides in the heavy-construction industry that they speedily caught up with and soon passed British contractors.

"The company by which I was employed had a solid background of successful tunnel construction before we came to the United States in 1904. We had just completed the Blackwall Tunnel under the Thames River in London, one of the first under-water vehicular tunnels ever built. There had been little work of this kind in America, and without previous experience contractors were both unable and unwilling to venture into the strange field of working under compressed air."

Serene Is the Word

An adequate one-word description of Arthur A. Johnson would be "serene". Seated behind his big flat-topped desk high in the Chatham-Phoenix Building in Long Island City, looking out over the maze of elevated tracks entering the transfer terminal at Queensboro Plaza, Mr. Johnson radiates a quiet charm unruffled by the vicissitudes of years of contracting. The only indications of his 65 years are found in thinned-out red hair and a few crow's-feet around twinkling blue eyes. As he signed his correspondence or scribbled some notes from a telephone conversation, Mr. Johnson slipped on a pair of shell-rimmed glasses. His regular features are dominated by a square jaw while his clear ruddy skin is covered with a liberal sprinkling of small freckles, the hallmark of one who has spent much time in the open. He has that solid frame characteristic of many construction men, 170 pounds well knit into 5 feet 8½ inches of height. A trace of his British ancestry remains in a slight Yorkshire accent highlighting a personality that combines both geniality and reserve in the right proportions. A. A. Johnson looks and acts the part of a successful contractor who can take big projects in stride without losing that pleasing aura of cordial dignity.

He was born in the cathedral town of Peterborough in central England in 1879 and was graduated from Deacons Technical School located there.

"Boys begin hard work and assume responsibilities much earlier in life in England than they do here in America," reminisced Mr. Johnson. "Immediately after graduation I was 'articled', or what might be termed here apprenticed, to a firm of engineers which was constructing a reservoir in South Wales. I picked up quite a bit of practical construction experience as an assistant engineer on that job, and later became an assistant superintendent on the construction of a cement plant. After some canal construction near Birmingham, I was appointed superintendent of 7½ miles of railroad work in southwestern England. Upon its completion, I became associated with S. Pearson & Son, Ltd., as General Superintendent on tunnel construction under the City of London for the Great Northern City Railway Co."

Early Tunnels in N. Y.

Thus when Arthur A. Johnson arrived in New York his training and experience had already assured him a position of great responsibility. Although tunnel work began in New York City in 1874 with the Hudson & Manhattan Railroad tunnel under the Hudson River from Jersey City to Morton Street, New York, this project was not officially opened until 1908. Digging under-water tunnels by mining and shoring was impossible because of the uncertain soil conditions and the ever-present danger of water. Working with shields and pneumatic pressure was still an innovation, with little knowledge available of such methods of construction. Only practical experience could determine how many hours and how hard a man could work under various degrees of air pressure. Industrial health laws now regulate such working conditions, but in those days the contractor had to experiment and draw his own conclusions.

"We were really in a pioneer field," Mr. Johnson reflected, "and had little to guide us, but what we learned has saved lives on construction jobs ever since."

Arthur A. Johnson, President of The Arthur A. Johnson Corp.

These four East River tunnels were completed by 1909, connecting at the

(*Continued on next page*)

ABOVE: Big T7 with 2½ yard bucket rips up old asphalt pavement and loads it.

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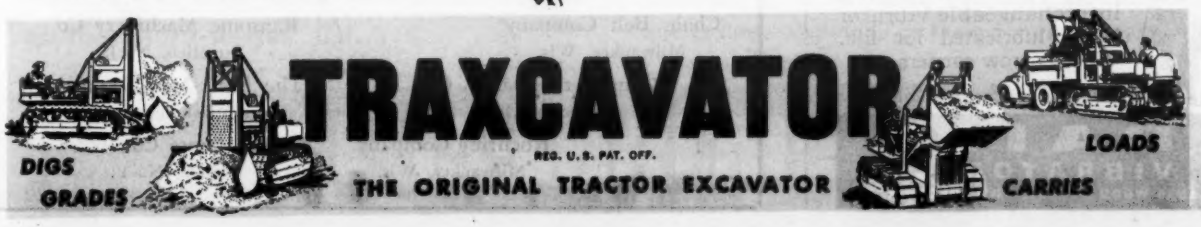


Arthur A. Johnson, New York Contractor

(*Continued from preceding page*)

west end with Manhattan cross-town tunnels from the Pennsylvania Railroad Station across New York under 32nd and 33rd Streets to First Avenue, and at the other end with the Long Island Railroad branch of the Pennsylvania Railroad in Long Island City.

Stays in America

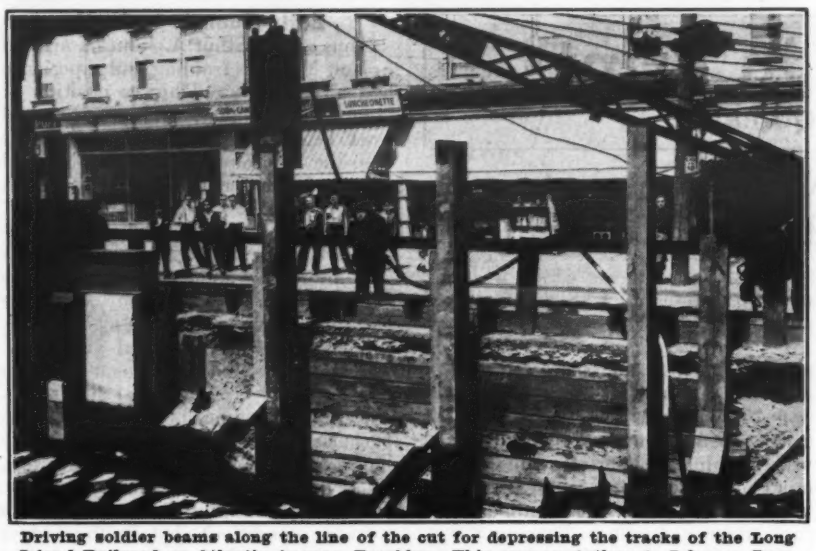
Four years in this country convinced the young but already veteran builder that he wanted to remain here in America, so when S. Pearson & Son, Ltd., returned to England, Arthur A. Johnson, with $2,000 he had saved from his salary, started his own contracting business. He had married before leaving England, and he now had two young sons. He foresaw the coming growth of New York City and felt that there would be rich opportunities in the heavy-construction field in the great metropolis.

"I decided to remain right where I began work here in New York, on the Queens side of the East River," Mr. Johnson remarked. "So I opened my office in Long Island City which is centrally located to all parts of the city. At first, naturally, my jobs were not very large—small paving and sewer contracts for the most part—but I did bid successfully on a contract to pave Queens Boulevard with bituminous macadam from Long Island City to Jamaica. Later on, in 1923, we returned to that location and widened the Boulevard from 20 to 200 feet most of its 7-mile length.

"In 1912 two important things happened to me. I became a citizen and also went broke. At Garrison, N. Y., we were digging tunnels deep in the rock in order to supply New York City with water from the Catskill Mountains. We were completing a project on which the original contractor had also failed. The two receivers carrying out the contract were at loggerheads with each other, with the result that we, who were in the middle, took a licking. Those were tough days, but I started all over again in 1915 and we have successfully weathered all other financial storms that have blown our way."

Corporation Organized

In 1921 The Arthur A. Johnson Corp. was organized and since then it has built six sections of the New York City subway system. Such work kept this contracting firm going even during the lean days of the depression. In 1933, for instance, when construction work was almost at a standstill, the company was working on two sections of the Independent Division of the City Transit System under Queens Boulevard in the Borough of Queens.



Driving soldier beams along the line of the cut for depressing the tracks of the Long Island Railroad on Atlantic Avenue, Brooklyn. This was an Arthur A. Johnson Corp. project in 1938-41.

According to Mr. Johnson, subway building is the toughest of all construction work. Adjoining buildings have to be protected from damage, especially blasting and undermining, during the construction period. The vast network of underground pipes and conduits have to be delicately handled and kept in working condition while traffic is maintained in the streets overhead. To speed up activities and to reduce the cost substantially, a system of shoring called the soldier-beam method was devised by the engineers of the Johnson Corp. This has since become a general method for supporting the sides of deep and wide trenches. I-beams spaced 8 to 10 feet apart are driven in straight rows at the edges of the intended cut, and as the

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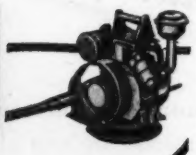
BAILY CONCRETE VIBRATORS



PAVEMENT VIBRATORS

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Tubular internal, extending entirely across slab, mounted in front of finisher. Gasoline or electric power plant with flexible shaft drive.

Vibrating pan, full-width, carried by two-wheeled trailer behind any standard finisher. Gasoline or electric power plant.

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The Knickerbocker Co., Jackson, Mich.

Arthur A. Johnson, New York Contractor

(*Continued from preceding page*)

excavation goes down, the openings between the rows of beams are closed with timber sections. This method is an improvement over vertical sheet piling which must be heavily cross-braced, with a resultant diminution of working space for construction equipment and other operations.

Another construction achievement in which Arthur A. Johnson takes pride was the building of Quabbin Dike, 1934-1937, at Enfield, near Springfield, Mass., to impound water for the Boston water supply. This earth-fill dam is 2,200 feet long, 136 feet high, and contains nearly 3,000,000 cubic yards of fill of which 2,000,000 yards was placed by a hydraulic method devised by the company engineers. This plan called for the excavation and a mile uphill haul of material by trucks from a borrow pit to an especially designed hog box. A hopper received the material; two reciprocating feeders pushed it down a steep narrow sluiceway where it was mixed with water and then pumped into the dam by a 20-inch hydraulic pump. From 8,000 to 10,000 cubic yards of material was delivered daily in this manner.

Work at World's Fair

"Another big contract came along about that same time," Mr. Johnson continued as he reviewed the construction operations of his company. "One of the speediest peacetime earth-moving jobs ever attempted was the preparation of the site at Flushing for the New York World's Fair in 1937. Since the war, of course, more earth has been moved and at greater speeds, but in such cases cost is no object and the work is not handled on a lump-sum contract basis.

"We bid $2,200,000 to move 7,000,000 cubic yards of earth around on that 1,216-acre site, to be completed in eight months with a penalty for non-completion of $2,000 per day. Part of the area was a golf course built on top of a former city dump, in one corner of which was an ash fill 90 feet high called Mount Corona. Although our bid was $330,000 higher than that of the lowest bidder, and higher even than that of the second contractor, we were awarded the contract by the Board of Estimate of the City of New York."

The Johnson reputation for getting jobs finished on time was responsible for this action and the faith imposed in the company by the Fair officials was not misplaced. While not performing miracles in completing the contract "the day before yesterday", as one Fair official hoped it could be done in those hectic days of planning for the doings on the Mad Meadows, the Johnson corporation did finish the grading operations two weeks ahead of the eight-months allotted time.

No great engineering difficulties were encountered at Flushing, but the key to the successful completion of the work lay in the organization and assembly of the contractor's work crews. New equipment costing $750,000 was purchased; a well planned program was set in motion; and work schedules covering the entire 24 hours of a day were followed. The bulk of the 7,000,000 yards was moved by shovels and a fleet of fifty Euclids, with the exception of 1,000,000 yards under water which was excavated by draglines. The ash mountain was leveled, two new artificial lakes were dug, and construction of the buildings started on schedule so that the Fair could open in 1939.

Varied Construction

While this work was in progress, the company was also excavating a subaqueous tunnel under the Flushing River to carry the pipes of the Consolidated Gas Co. More tunnel work included a bore through a hill for the Lehigh Cement Co. at Alsen, N. Y., to connect the mill on one side of the ridge with the limestone quarry on the opposite side. Cars filled with lime rock were moved through this tunnel on tracks. Another tunnel, 3½ miles long, was dug in the Bronx for a sewer to the Ward's Island treatment plant. Other company work of importance includes the development of beautiful Fort Tryon Park in Manhattan, reconstructing the boardwalk at Coney Island, and digging foundations for such large office structures as telephone company buildings in New York, Albany, and Brooklyn. The latter foundation was 60 feet deep with an intricate system of shoring, sheeting, and underpinning to protect adjoining structures.

From 1938 to 1941 the company was engaged in depressing the tracks of the Long Island Railroad along Atlantic Avenue, Brooklyn. As these tracks originally entered the city, they were at grade but further on were carried overhead. Rail traffic had to be maintained on this elevated structure while a subway was being constructed directly beneath. About 300 columns on this steel structure had to be underpinned by con-

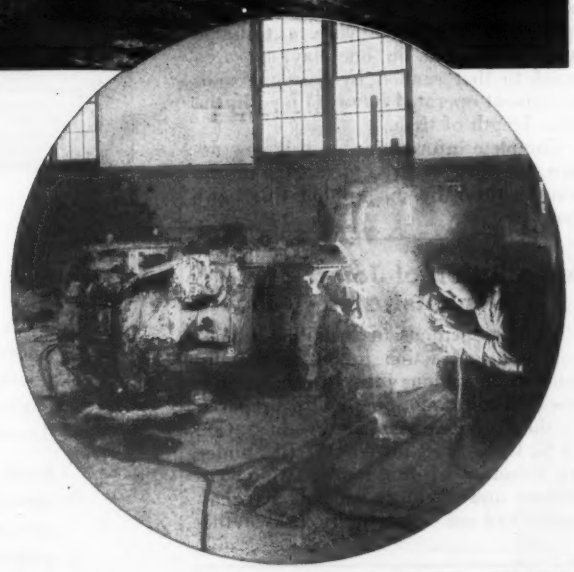
(*Continued on page 69*)

The Arthur A. Johnson Corp. developed a novel method of hydraulic sluicing for the 2,200-foot earth-fill Quabbin Dike in Massachusetts for the Boston Metropolitan Water Supply District.

ARE *YOU* READY FOR THE BIG PROGRAM?

The big, proposed construction program may break anytime! It is on the "must" list to cushion the shock of reconversion . . . at the same time provide the good roads, streets and airports needed for increased post-war traffic.

Are you ready? Is your present equipment in condition to handle tough work? You may have to rely on it. Until war and rehabilitation needs are satisfied . . . new tractors and other road machinery will be on the "hard-to-get" list.



While there is time . . . put your outfit in A-1 condition. Let your Allis-Chalmers dealer lend a hand. Make full use of his skilled mechanics, modern tools and facilities. Get ready for the big program . . . NOW!

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Right to Victory with War Bonds

The new Jumbo Truck Loader.

Self-Loading Truck Unit for Maintenance

A new device of particular interest to highway maintenance men has come out of the West. It is a hydraulically operated 1-yard shovel which is attached directly to the chassis of a dump truck and which, working on the "over-the-top" principle, picks up its load in front of the truck and carries it over the cab to dump into the body.

The manufacturer, Western Industrial Engineering Co., 3301 Medford St., Los Angeles 33, Calif., says this Jumbo Truck Loader requires only the truck driver to operate it on a 6-second loading cycle. The shovel is controlled by one lever in the cab and can be stopped in any position. The shovel arms can be automatically locked into the body to add stability when the shovel is used for spreading. The Jumbo Loader is adaptable to cab-over-engine or conventional trucks of all makes or models.

Two uses to which maintenance men could put such a unit effectively are removing small landslides on mountain roads or debris left by overflow from heavy rains. A truck with this loader can work in the slide or debris without blocking more than one lane of traffic. For road maintenance, the loader on a dump truck makes it possible to pick up and haul a small amount of material to repair a bad spot, to load and spread material for an entire road surface, to pick up and spread sand over icy pavements, and other similar work. It is reported that on one airport job one man operating the loader with a tail-gate spreader sanded, in one day, an area equal to that sanded by five pieces of equipment operated by seven men in the same length of time.

Complete information on this new device may be secured direct from the manufacturer by mentioning this news item.

Installation of Joints Demonstrated in Movie

Modern methods of installing expansion and contraction joints, as actually handled on various jobs, are shown in a new full-color motion picture prepared by the Keystone Asphalt Products Co., 43 E. Ohio St., Chicago 11, Ill., under the direction of Jim Poole. Many engineers and highway officials have already had an opportunity to see this demonstration of the ease of handling and economies of modern installation methods, as the picture was shown at the AASHO meeting in Cincinnati, the ARBA convention in Chicago, and at numerous private showings to highway groups. It was most recently presented at the Purdue Road School in January.

Arrangements may be made for showings of this movie "Installation of Mastic Board Dummy Joint and Center Strip" to representative groups interested in the latest developments in highway design and construction. Just write to Keystone on your official stationery and refer to this item.

Army Uses Substitute For Usual Tarpaulins

Substantial quantities of cotton duck will be saved by the Army through the adoption of a paper-and-burlap-lamination tarpaulin to provide waterproof coverings for front-line supplies. It is anticipated that the savings of cotton duck will amount to millions of yards during 1945 and, at the same time, it will be possible to increase the supply of waterproof coverings available for front-line use.

Paper laminated with burlap by means of a special asphalt has provided satisfactory protection for the packaging of many Quartermaster Corps supplies shipped to all parts of the world, but this is the first time these materials have been used for continuous exposure under the wide variety of weather conditions encountered in fighting a global war. Tests on the paper-and-burlap tarpaulin indicate that good durability can be obtained with materials immediately available in large quantities. The cost of the new tarpaulin will be much less than for cotton duck, and the reduction in both weight and bulk combine to conserve shipping space and provide a unit which can be handled by two men with ease.

The specifications show that this is really an adaptation of one of the types of curing paper used on concrete roads by many contractors and state highway departments in the pre-war years where the paper and asphalt furnished a waterproofing element and the burlap gave additional strength to the lamination.

SAVING BOTH SPACE AND WEIGHT

This is a pair of General Motors series 71 Diesel engines built side by side, delivering their power through a single shaft. It is Detroit Diesel engineers' answer to an urgent call for a lot of dependable Diesel power in a small space.

Some of the jobs assigned the basic series 71 power units in "Singles," "Twins," and "Quads" are among the toughest on the books today—powering landing craft and driving Army M-3, M-4 tanks and M-10 tank destroyers.

It takes "oomph"—plenty of it—to plow a tank through hip-deep mud, to lift it out of shell craters, to keep it hot after the enemy—to beach and extricate a landing craft when the breakers are running high.

So it is easy to look ahead and see how these "multiple" Diesels will take hold of the countless jobs of industry and perform them equally well—particularly where the ratio of power to weight or space is of prime importance.

And remember, these "Twins" and "Quads," like the single sixes, share all the important developments which General Motors has contributed to Diesel science.

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Maintenance Methods On Wyoming Highways

Twenty-Five Maintenance Shops Scattered Over State; Two-Way Radio; Materials; Patching and Sealing; Scoria

♦ THE Wyoming Highway Department makes full use of the excellent soil conditions over much of the state and the ready availability of satisfactory materials for base and mat construction in the maintenance of the 4,113 miles of roads under its control. The state has a population of only 250,742 in an area of 97,914 square miles. Light annual rainfall aids in maintenance, but high altitude, severe cold, heavy snowfalls, and great distances between towns add to the difficulties.

General Organization

The state highway system consists of 3,969 miles of oil-mat surfaced roads, 41 miles of gravel roads, 63 miles of graded earth roads, and 40 miles which are still unimproved.

Central office supervision of maintenance is exercised by J. R. Bromley, Superintendent of the Highway Department, and W. E. Sutton, Division and Equipment Engineer. The state is divided into five maintenance districts, each directly supervised by District Maintenance Engineers located at Cheyenne, Casper, Sheridan, Lander, and Rock Springs. Each District Maintenance Engineer is assisted by several crew foremen, usually one for each county in his district, and the crew foremen have organizations which include a motor-grader operator, who doubles in various other capacities, for each 25 miles of road in his section. These men work on an annual salary and their services are augmented by those of as many men on an hourly basis as are needed to complete the current work. A crew foreman's organization is equipped to handle all the various types of work in his area, whether it be repair of bituminous surfaces and seal-coat applications to them; repair of drainage structures; mowing; or snow removal and ice control.

Each District Maintenance Engineer has his headquarters at a district maintenance shop and, in addition to the five shops used as headquarters, there are fifteen sub-shops of similar construction at Kemmerer, Evanston, Rawlins, Laramie, Wheatland, Lusk, Sundance, Gillette, Buffalo, Muddy Gap, Thermopolis, Cody, Basin, Jackson, and Daniel, well distributed throughout the state. In addition to these twenty shops of modern construction, old frame sub-shops are located at Afton, Torrington, New Castle, Dubois, and Saratoga. These sub-shops all provide outside storage, heated storage, fueling and lubrication, and repair facilities, the extent of which is varied with the need.

Upkeep of all maintenance and construction department equipment is paid for from funds set aside through an hourly rental charge for the use of the equipment. This rental charge, which is revised at frequent intervals as accurate accounting justifies, covers depreciation, repairs, storage, and tires as well as the cost of fuel and lubricants. The total charge is distributed to the cost of the job or function on an hourly or mileage basis.

A Typical Shop

The sub-shop at Basin is typical of the twenty new and modern facilities. It is a one-story 100 x 55-foot brick building with a steel-beam ceiling allowing clear floor space in the shop area, which is 80 x 55 feet, entered by two 16-foot overhead doors, one in the south end and one on the east side. A 20-foot section at the north end of the building is partitioned off from the shop to provide offices in the northwest corner, washroom and locker room in the back, and a stock room having two levels for the storage of parts, signs, and records in the northeast corner. A coal-fired steam plant in the basement heats

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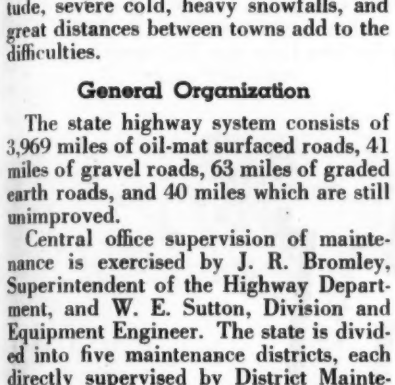
C. & E. M. Photo

Blade-mixing patching material for Wyoming highways on the Lander oval.



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STANDING ROOM ONLY FOR DURATION

Beebe Bros. All-Steel Hand Hoists carry the highest resale value of any piece of equipment in the world. If you have one not in use, sell it. Many more than are available are urgently needed in the win-the-war program. Thanks.

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SMOOTH AS OIL!

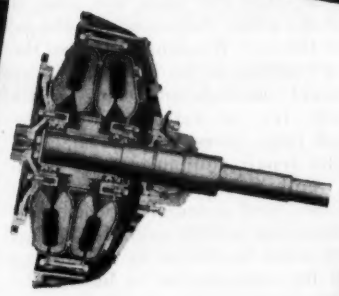
No shock—no stall—no loafing—with FLUID-DRIVE LORAIN 82!

YOU can tackle a mountain of rock—or any other tough job—with a Lorain 82 and get the most out of every work-minute! These husky shovels are equipped with a life-saving, shock-absorbing hydraulic coupling that smooths out heaviest digging shocks and keeps the engine pulling at peak power under toughest loads. You just can't stall the engine!

No matter how big the rock or how tight it's lodged, the Lorain 82 hangs on until it's in the dipper. Sudden jerks, impacts and other shocks are cushioned by the spinning oil clutch—eliminating stress and strain on mechanism and cables and greatly lessening operator fatigue.

Combine this life-prolonging feature with Lorain center-drive direct-to-the-point power application, two-speed chain drive crawler, all-steel all-welded boom, all-steel dipper stick and new, streamlined dipper and you've got the ideal rock shovel—the Lorain 82!

If you want shovel performance that's literally "smooth as oil" and new, low per-yard handling costs, write for complete data on the shockproofed shovel.



Power for the Lorain 82 flows through this hydraulic coupling. Shocks impacts and sudden strains on the mechanism and cables are cushioned and absorbed by the fluid connection.

Reg. Trade Mark

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THE THEW SHOVEL CO.
LORAIN, OHIO

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

Maintenance Methods On Wyoming Highways

(*Continued from preceding page*)

the building through unit heaters located at intervals throughout the shop and office space.

A David Round & Son overhead traveling crane of 2-ton capacity serves the northwest corner of the building and is used to move heavy assemblies to the machine tools and work benches. An 8-foot x 16-inch South Bend lathe and a Canadian Fairbanks-Morse drill press with two pedestal grinders and buffers are located in this part of the shop. One overhead electric motor drives the lathe and drill press, while the pedestal grinders have individual electric motors. A mechanic was using a portable Lincoln arc welder for repairs to an Austin-Western 99 motor grader at the time of our inspection and there is also available Oxweld equipment for oxy-acetylene welding. A Walker rolling jack was in use where a Coleman truck was undergoing repairs preparatory to snow-plowing service.

Under the windows on the west side of the shop, a steel bench 20 feet long and 4 feet wide contains drawers and lockers for the storage of small tools and parts, and a tire repair outfit and brake-lining machine were conveniently located near this bench. A gasoline pump for dispensing fuel stands just outside the east doorway and a Curtis compressor located just inside the shop furnishes air for tire inflation. Greasing is done from a pit located near one of the doors, thus eliminating the need for a hoist to expedite greasing.

The shop building is located on a 3-acre plot adjacent to the C B & Q Railroad and is enclosed by a woven-wire fence. A timber ramp and gallows frame with hand-operated hoist are available outside for handling heavy items for hauling and two 12,000-gallon elevated steel tanks in the northeast corner of the yard are used for the storage of asphalt. These tanks have a 6-inch discharge line and with the grades of cut-back asphalt ordinarily stored will discharge into booster trucks without preliminary heating. An old frame building formerly used as a shop is located across the road from the new shop, and is now used for the dead storage of trucks and equipment.

Only two mechanics are employed at the Basin shop, but more are used at some of the other shops and sub-shops. Prior to the war, Wyoming followed the policy of trading-in for new machinery at frequent intervals and consequently its needs for an extensive organization and large investments in machine tools and repair equipment were minimized. Although this policy was both satisfactory and economical when new equipment was readily available, it has entailed some hardships in an attempt to staff the organization to handle the extensive repairs and rebuilding which are now necessary.

Two-Way Radio Service

Due to the long distances between towns and the resultant unavailability of telephones, the use of two-way radio is particularly valuable in the operation of the Wyoming Highway Department. Before the war, a program of completely covering the state and equipping all maintenance units with instant communication was undertaken. The completion of this program was delayed by the war and at present only five broadcasting stations are in operation, 250-watt stations at Cheyenne, Rock Springs, Sheridan, and Rawlins, and a 500-watt station at Casper. Installation of a 250-watt station at Cody is now under way but the completion of that station will be the only extension of radio communications until after the war.

The cars of the Superintendent and the Division and Equipment Engineer from the central office and the cars for the five District Maintenance Engineers are equipped with two-way radios, and a few pick-up trucks driven by crew foremen also have been so equipped. The value of this type of communication has been so thoroughly demonstrated, particularly during the battles with ice and snow, that the Department anxiously awaits the time when its plans can be completed.

Construction and Maintenance

Wyoming is blessed with the presence, in most of the state, of soils of A-2 and A-4 classification, and this fact, coupled with the moderate precipitation, ranging from 6 to 18 inches, fairly well concentrated during the months from February to June, reduces maintenance expense materially and influences design.

Excellent deposits of sandy gravels are available in most sections of the state, and production of base gravels, as well as aggregate and seal-coat materials for bituminous surfacing, is a relatively inexpensive operation. The natural deposits require no blasting and no excessive amount of crushing. In the bank deposits, little gravel above 5-inch diameter is encountered. This material provides excellent pit-run sub-bases, and requires only 25 to 30 per cent of crushing to provide the 1-inch maximum size used for crushed-gravel bases and mineral aggregates.

River bars, also well distributed, provide a material quite uniformly graded in which about 25 per cent passes a No. 10 sieve, 5 per cent passes a No. 200, and only 10 to 15 per cent is larger than the ½-inch maximum specified for seal coats.

The gravels are largely of granitic origin with some hornblende and schists in the western part of the state and some sandstones and shales in other localized areas. Even the limestone which is occasionally found is usually laminated and can be loosened by heavy rooters without blasting, although it has a Los Angeles rattler-test loss of only 30.

In the areas where excellent subgrade conditions exist, an 8-inch gravel base is usually considered adequate on a subgrade compacted to 90 per cent of AASHO density. Subgrades are crowned so as to provide surface drainage and the semi-pervious gravel bases and 1½ inches of additional base thickness at the shoulder lines care for subsurface drain-

(*Continued on page 77*)

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COMMERCIAL HEAT TREATING
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NITRIDING—A SPECIALTY

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Sinclair RUST-O-LENE B for exposed metal surfaces of machinery in operation, in storage, or in transit

—provides a firmly-adhering rust proofing film
—prevents rusting of clean surfaces
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Sinclair OPALINE RP (Rust Preventing) OILS for enclosed oil systems, prevent internal rusting of engines, hydraulic systems, gear reducers, and similar machinery intermittently operated, stored, or transported. OPALINE RP also has ample lubricating qualities for temporary use.

Both these remarkable Sinclair rust-preventives have successfully passed the most exacting service tests, and fully meet Government specifications.

Learn how RUST-O-LENE B and OPALINE RP can combat rust for you. Write for brochure giving full details.

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Rust-O-Lene-Opaline Reg. U. S. Pat. Off.

Subgrading at Boeing Field, Benton, Washington. An Athey MobiLoader on a Caterpillar D8 loading hard-packed sandstone, streaked with blue clay, into a 2-yard truck.

Types of Guard Rail; Service Comparisons

Guard rail is needed wherever cars running off the highway would upset or crash into something before being brought under control. The purpose of guard rail is, first, to warn drivers of danger, and, second, to deflect out-of-control cars back on the highway, and prevent their upsetting or crashing into stationary objects.

To accomplish these purposes, guard rail should have two primary qualities: visibility by day or night, and deflective ability. The ability to deflect a fast-moving car is far more important than ability to stop the car. A strong stone wall or a stout tree will stop a car, but it will also wreck the car, and may kill its occupants. That is not the function of guard rail. Other factors enter into the consideration of effective guard rail, such as appearance, ease of erection, initial cost, and maintenance cost, but if the primary purpose of guard rail is to save lives, the major consideration should be deflective ability.

Below we point out the generally accepted advantages and disadvantages of various types of guard rail:

1. A row of wood posts: Low in first cost; visibility fair if kept painted white; deflective ability, zero. If a car hits them, it either breaks through or is smashed by the posts.

2. A row of posts with wire cable: Low in cost; visibility fair; some deflective ability when equipped with offset fittings to hold the cable a few inches out from the posts. An advantage to be considered is that it offers little obstruction to snow removal.

3. A row of posts with wood horizontal railings: Low in first cost; high in maintenance cost; visibility good, if kept painted. Deflective ability is zero unless made of very heavy timber. The hazard from 4 x 5 or 2 x 6 timbers is great, as death may result from timbers going through the windshield of a car hitting this type of guard rail.

4. A row of posts with heavy wood horizontal timbers or logs: Cost medium; visibility good. Sound planks of 4 x 10 or larger make fair guard rail, especially if mounted on cushioning springs of some kind which permit the timbers to yield inwardly 3 or 4 inches when struck a glancing blow. Rustic logs, stained brown, have poor visibility at night and not much better visibility in the daytime.

5. Wire-mesh reinforcing: Low in first cost; visibility fair; deflective ability poor; strength good. This type of guard is flexible, so that a vehicle striking a glancing blow at an acute angle deflects the mesh until the angle of impact becomes a right angle and the vehicle is stopped. Maintenance cost is high, and appearance poor unless constantly maintained.

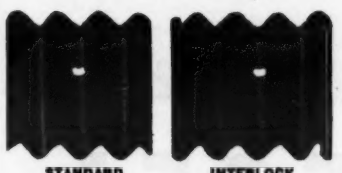
6. Steel-plate guard rail: Visibility good; deflective ability good; initial cost higher; maintenance cost low.

"Here's a curve sign the motorist'll be sure to notice!"

For Economy Specify

CORRUGATED STEEL SHEET PILING

Corrugated Steel Sheet Piling is MOBILE. It is easily pulled, transported, and driven over and over again. And this mobility means economy . . . savings in time . . . investment . . . space and labor. For Corrugated's strong, lightweight construction PLUS its special nesting feature solves transportation problems. Extremely durable, it can be used and re-used—distributing initial cost over many jobs. Our catalog has complete technical data; tables; and shows various uses.



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OREGON STATE HIGHWAY DEPARTMENT
Surface Graph
Johnson Mechanical Float Finisher
100 Ft.
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Inches in 10 Feet

FACTS EVERY CONTRACTOR SHOULD KNOW

The Johnson Float Finisher is efficient on all modern vertical, horizontal and transverse spiral curves.

This finisher makes a smoother, more perfect road surface (see graph).

Has been in use in western states for 7 years.

Keeps up with the largest high-capacity mixers.

Maintains daily production speed—never grows tired.

Equipped with trailer hitch and wheels for short hauls.

Can be dismantled into legal truckload complying with highway regulations.

Write for Catalog

. . . finished with a Madsen-built

JOHNSON FLOAT FINISHER

CONTRACTORS! You can increase the daily production of your paving crew . . . reduce finishing costs by 50% . . . and eliminate the bottleneck of hand float finishing with a Johnson Float Finisher. It reduces the finishing crew to two men for a complete job including edging and jointing on any paving project using a seven-sack paver.

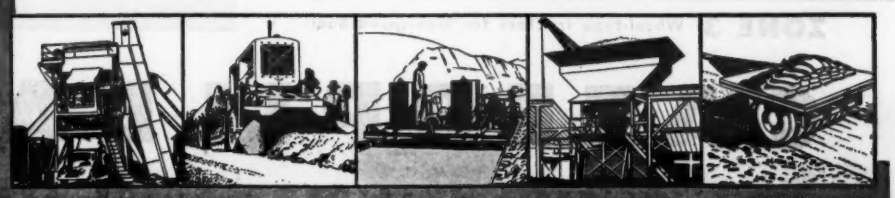
When Roy Houck, Oregon paving contractor, placed 746 cu. yds. of concrete and finished 3065 lin. ft. of pavement in an 8-hour day (383 ft. per hr.), he set a record of production and the Johnson Finisher helped make it possible.

He did not set a record for finishing—the speed of the Johnson Float Finisher is far greater than required under present-day cement concrete production methods.

With the savings in labor and the increased production of the paving crew, the Johnson Float Finisher will pay for itself in 25 miles or less of double-strip highway.

Plan for tomorrow, today! Write for Catalog No. MP-140.

MADSEN IRON WORKS
HUNTINGTON PARK, CALIFORNIA



MADSEN ASPHALT PLANTS • ROAD PUGS • CEMENT FINISHERS • BATCHERS • COMPACTORS

State to Rent Machines To Town Highway Depts.

Highway work, both construction and maintenance, can be done more economically, quickly, and efficiently, by the use of road building machinery. Such machinery, of course, is expensive. The Vermont Department of Highways, feeling that many towns in the state cannot afford to buy such equipment, and in a good many cases would not have enough work of their own to warrant such an expenditure as would be required, proposes after the war to install in each of its districts several power shovels, bulldozers, and power graders. These will be available to towns at a minimum rental charge for work on their state-aid and town highways. No town can afford not to make use of such equipment.

Heavy-Duty Trailers

The line of Rogers heavy-duty trailers and semi-trailers for very tough or unusual hauling jobs is described and illustrated in a 28-page catalog just received. Constructed with low decks and rear-wheel housings for easy loading, these gooseneck trailers are featured by free spring action and axle alignment regardless of load weight, a rugged easy-turning fifth wheel, and heavy-flanged gooseneck-shaped side-plate construction which permits the dolly to be turned at an angle in excess of 90 degrees. All parts are electrically welded.

Rogers trailers are made with both level and drop decks, and in special designs which are shorter and lighter than standard models. Capacities range from 5 to 75 tons.

Copies of this new descriptive catalog are available upon application to Rogers Brothers Corp., Albion, Penna., and mention of this review.

Highway Personnel Appointments in Ky

All road design in Kentucky ha been placed under one head by Highwa Commissioner J. Stephen Watkins, wit the appointment of Dwight H. Bray, for merly Maintenance Director, to be Direc tor of Road Design. Mr. Bray wil supervise the state's proposed $75,000,000 post-war road-building program.

Harry D. Metcalf, for the past six years Chief Engineer of Road Maintenance of the Ohio Department of Highways, has been appointed Maintenance Director, succeeding Mr. Bray.

EVERY successful earthmover knows that a big job is likely to require different kinds of machines. He uses both track-type and wheel-type tractors—whichever kind of hauling power will move the *most yards* in the *fastest time* at the *lowest cost*.

BOTH HAVE THEIR PLACE

On all jobs, traction, maneuverability and drawbar power are necessary. That's where track-type tractors handle yardage fast. Where dirt has to be hauled a long distance to the fill, the higher road-speed of rubber tires is an advantage.

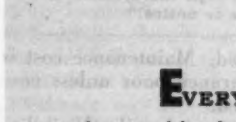
"CATERPILLAR" BUILDS BOTH

No manufacturer in the world has had more experience in building both track-type and rubber-tired earthmoving machinery than "Caterpillar." The great work record of the "Caterpillar" track-type Tractor needs no comment. "Caterpillar" Diesel Motor Graders have rolled on rubber since they were introduced, in 1931. And "Caterpillar" Diesel wheel-type Tractors have been delivering profitable high-speed performance for five years.

Your "Caterpillar" dealer offers *both* types of tractors and matched equipment. Therefore, he can give you unbiased counsel in helping you choose the right equipment for any earth-moving job. See him soon.

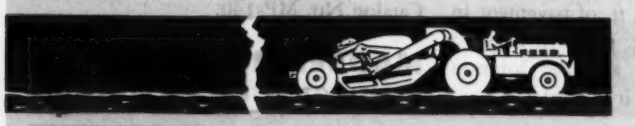
CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

Zone your equipment for lowest costs on earth

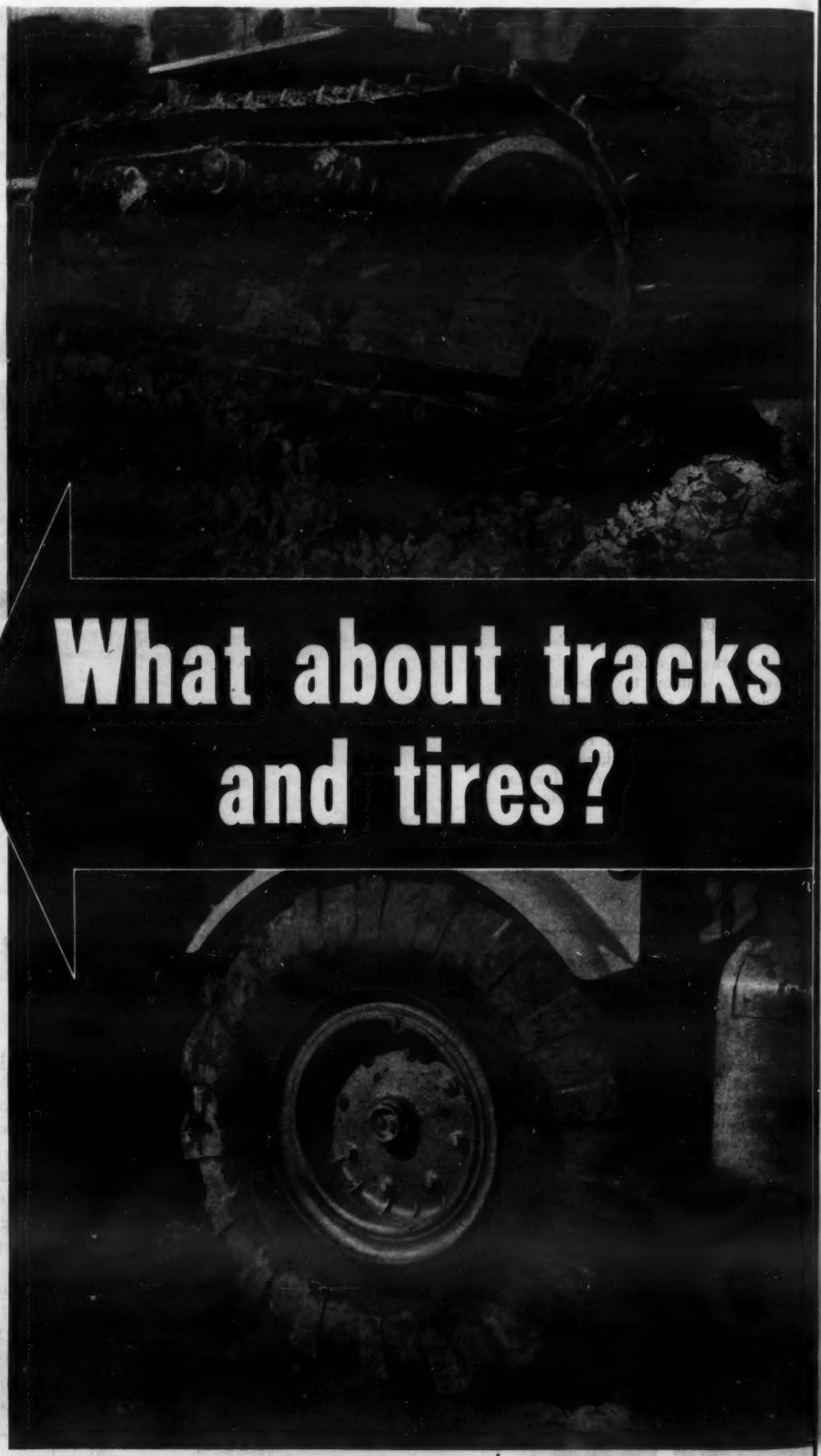


ZONE 1 Track-type tractors, equipped with bulldozers and rippers.

ZONE 2 Track-type tractors for loading and pulling scrapers.



ZONE 3 Wheel-type tractors for high-speed hauls.



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ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

Long Haul of Gravel For Road-Mix Project

New Bituminous Top Mixed On South Minnesota Road By Traveling Plant; Gravel Secured From Excellent Pit

✦ A CONTRACT awarded last summer by the Minnesota Department of Highways to Jud Brown and Lundeen Brothers, Mankato, Minn., provided for placing a 150-pound bituminous mat 26 feet wide on 12.8 miles of Trunk Highway 60 lying on the line between LeSueur and Waseca Counties in southern Minnesota. A gravel pit providing very economical working conditions was available, and even though its use required a 13-mile dead haul to the west end of the job, the aggregate from it could be processed with sufficient economy to offset the cost of the 19-mile average haul.

Aggregate Production

Working against a 30-foot face of gravel, stable enough for safety but which could be dropped without blasting, a ¾-cubic-yard Link-Belt Speeder shovel loaded the material into a 6-cubic-yard circular steel bin whose bottom gates fed a 40-foot Diamond Iron Works conveyor with a 24-inch belt. This conveyor transported the material to the 4 x 12-foot double-deck shaker screen of a Buda-powered Diamond screening and crushing plant. About 20 per cent of the material, with a maximum size of 2 inches, was retained on the 1¼-inch square screen of the upper deck and passed to the 10 x 36-inch jaw crusher. That portion of the material passing the top screen and retained on the lower one, having ¾-inch square openings, went to the 30-inch rolls. Discharge from both crushers was recirculated to the screens.

The storage bin of the plant discharged onto a second belt conveyor which was controlled by a gate man, standing in a position to receive signals from the weigher. This 24-inch belt was placed to raise the material discharged from the gravel plant's storage hopper to a point above a truck standing on the 30,000-pound-capacity Fairbanks scale installed in front of the gravel plant. In the scale house the State Department of Highways weigher adjusted the beams for the various tare weights which he obtained from a list posted in front of him, and signaled the gate man so that loading could be stopped when the desired 6-ton load was on the truck. This load, averaging about 4 cubic yards, was hauled in trucks using 8.25-inch tires, dual-mounted on the rear axle. An average of thirty-three trucks was used on the 19-mile haul, seventeen of which belonged to the contractor, with the rest hired, but according to the Superintendent this number was insufficient and reduced the output of the plant from the 2,000 tons which the Superintendent felt was its full capacity to a 1,300-ton average production in the 13-hour operating day. A shovel operator and an oiler, the plant operator, and a laborer comprised the entire crew at the plant.

On the road, the trucks were dumped in the proper space for the weight of load which was measured off by the same two men who dumped them. The dumped material was windrowed by an Adams motor grader, which also aided in drying the gravel by spreading it in a thin layer on the existing surface as well as by repeated blading.

The specified grading of the mineral aggregate used follows:

Passing	Per Cent
¾-inch sieve	100
⅝-inch sieve	95-100
⅜-inch sieve	65-95
No. 10 sieve	35-65
No. 40 sieve	15-35
No. 200 sieve	4-8

The liquid limit of the fraction passing the No. 40 sieve was a maximum of 25.

Bituminous Surfacing

A prime of MC-1, 0.15 gallon per square yard, was placed on the portions of the old road where it had been necessary to remove the surfacing to make base repairs. The prime was permitted to cure before the windrow of mineral aggregate was placed at the rate of 150 pounds per square yard of the 26-foot-wide surface. Prior to mixing, the mineral aggregate was dried to a moisture

(*Continued on next page*)

C. & E. M. Photo

Material processed by the Diamond screening and crushing plant was delivered by belt conveyor to trucks standing on a platform scale to insure uniform 6-ton loads.

"TRAVEL-AIR"—tractor mounted and powered compressor for pioneer road building, advance engineering work and the rugged conditions of railroad and oil field construction.

Designed specifically for Caterpillar and International Tractors and force feed lubricated, it can work in any position the tractor takes. Available in 160 to 315 ft. sizes with all attachments and installation blueprints. "TRAVEL-AIR" is one of the many advancements presented in a complete catalog of Jaeger "AIR PLUS" Compressors, just off the press. Ask for your copy. THE JAEGER MACHINE COMPANY, 701 Dublin Avenue, Columbus 16, Ohio.

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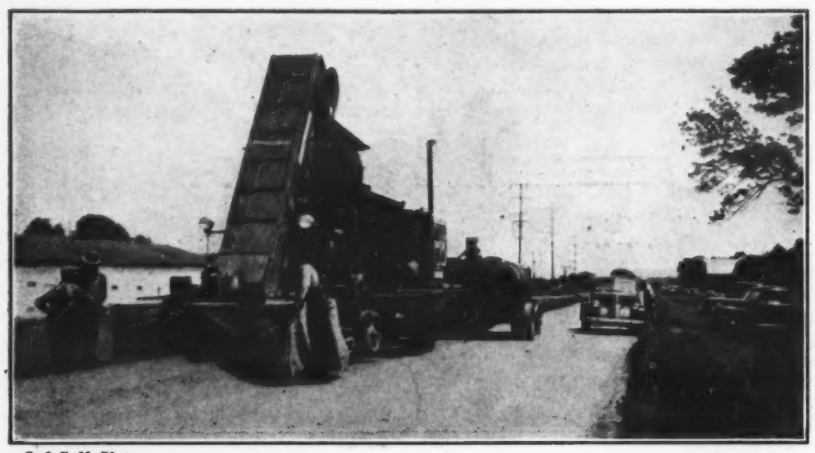

C. & E. M. Photo
A Barber-Greene traveling plant working on a bituminous-mat contract in Minnesota was equipped with a canvas curtain to conserve the fines in the windrow.

Road-Mix Project

(Continued from preceding page)

content of 1 to 1½ per cent by blading and left in a uniform ridged windrow along one side of the road to permit passage of traffic on the opposite side of the highway.

A Barber-Greene Model 848 traveling mixer was used to pick up and mix the windrow of aggregate with 0.95 gallon of MC-3 per square yard at a temperature of 185 to 200 degrees. A gate opening of 7 1/16 inches to control the flow of aggregate to the mixer box, combined with the use of a 26-tooth sprocket to drive the asphalt pump, furnished the proper mixture. To conserve the finer particles of the mineral aggregate, a curtain of canvas was stretched over a frame on the front end of the traveling plant, covering the windrow for 4 or 5 feet ahead of the elevator. The average day's mixing of 5,500 to 6,000 feet kept pace with the daily production of the gravel plant.

Asphalt was shipped by rail to a siding near the center of the job. There a Cleaver-Brooks tank-car heater heated and transferred it in an average time of 14 minutes to the two 1,000-gallon tank trucks or to the 1,000-gallon Rosco Model SRD distributor used for priming and tack-coat application. A rectangular steel storage tank 4 x 6 x 10 feet in size, mounted on a trailer, furnished auxiliary storage and a Diamond T truck moved this tank and the car heater as needed.

The two booster trucks fed the traveling plant, being alternately attached to it by a ⅝-inch cable while the driver steered the truck as it was pulled backwards down the road by the Barber-Greene machine. Any asphalt spilled on the base during the connecting of the booster tanks to the traveling plant was immediately blotted by a laborer who shoveled mineral aggregate from the windrow on it, mixing it with the spilled asphalt, and then discarding the mixture along the shoulders.

Curing and any reduction in moisture content of the mixed windrow, necessitated by rains after mixing, were performed by an Adams motor grader. Usually, moving the windrow over the tack coat and spreading were sufficient for this purpose. A tack coat of 0.05 to 0.08 gallon of MC-3 per square yard was applied to one-half the road at a time, and the mixed windrow moved from one side of the road to the other while the tack coat was being applied to alternate halves of the road. This operation was done immediately before spreading of the surface course was started.

Spreading was ordinarily conducted 1 to 2 miles behind the mixing operation. After the tack coat had been applied to the full width of the old road surface, the windrow was split, forming two equal windrows down the outer edges of the roadway, then spread and shaped to the center of the road. In this operation two Adams motor graders were used, one doing the rough spreading and a second, with a more skilled operator, doing the final shaping. Rolling was done by a Bros 7-wheel pneumatic-tire roller followed by an 8-ton Buffalo-Springfield 3-wheel roller.

Located in a convenient open space near the middle of the job were three 8 x 15-foot trailers, one of which was used by the contractor for an office, one for a stockroom, and the third for living quarters. A Chevrolet truck mounting a Hobart arc welder and gas tanks with

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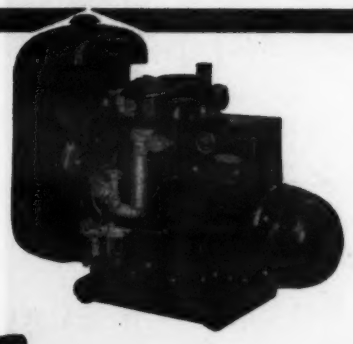

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● You'll be seeing "MEN WANTED" signs on highway, road and street construction jobs all over America when peace comes.

A bill has been passed which authorizes the spending of a billion and a half dollars of federal money on a postwar highway plan. To receive its share of these funds, each state must vote an equal amount of money for the program.

This plan, sponsored by the American Road Builders' Association, will benefit veterans because it is calculated to provide jobs for 3,000,000 men on actual highway construction and for many more in durable and consumer goods industries.

It will benefit all America by providing the modern highways, roads and streets needed for postwar business and recreation.

The plan will help create a prosperous postwar economy by its need for many products.

This vital plan for providing employment for returning soldiers is fully described in an informative illustrated booklet entitled, "THE ROAD AHEAD." Write for your free copy to the American Road Builders' Association, 1319 F Street N. W., Washington 4, D. C.

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AMERICAN CHAIN & CABLE

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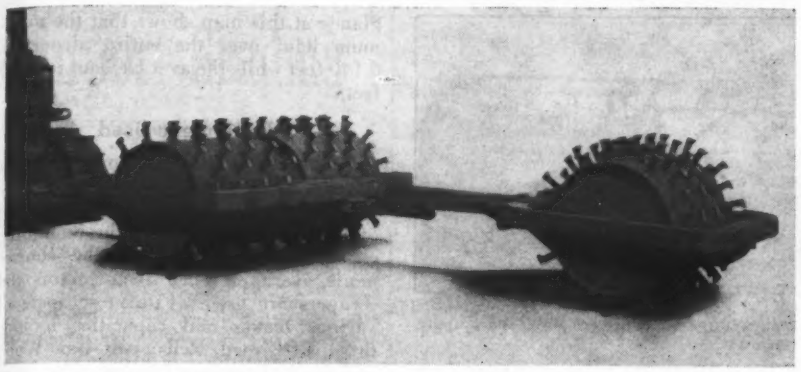
In Business for Your Safety



A tandem hitch of a trio of the new line of Baker tamping rollers.

Sheepsfoot Rollers To Be Made by Baker

A new line of sheepsfoot tamping rollers is to be made by the Baker Mfg. Co., 585 Stanford Ave., Springfield, Ill., for use with Allis-Chalmers crawler tractors. These rollers will be put into limited production as war conditions permit.

The announced features include a heavily reinforced box-type welded steel frame, rollers that turn on axles which pass through lubricant-retaining tubes so that the water used to increase the weight of the roller cannot come in contact with the axles, self-aligning roller bearings on each side of the roller, forged tampers with readily renewable heads to minimize tearing up of compacted material, shear-type tamper cleaners front and rear, and a spring-cushioned drawbar.

Each roller in its frame constitutes a unit with a removable tongue. Dual and triple-roll units are formed by using front and rear tie bars which permit the rolls to oscillate independently of each other. A clevis on the rear tie bar permits the use of the rollers in tandem.

A new bulletin, No. 847, describing the new tampers may be secured by writing direct to Baker and mentioning this illustrated item.

Flashlight Batteries Charged by Car Battery

A new charger for recharging Ideal rechargeable flashlight storage batteries from an automobile or truck battery has been announced by the Ideal Commutator Dresser Co., 1366 Park Ave., Sycamore, Ill. This new charger is easily installed and connects directly to the "live" side of the ignition system. It is neat and compact and does not interfere in any way with the operation of the vehicle, and may be mounted either on the dashboard or on the side panel just inside the door. A small pilot lamp on the charger indicates when the flashlight battery is charging, which may be done without the motor running.

The Ideal rechargeable flashlight battery fits all popular two-cell 1¼-inch Size D flashlight cases. Now in its fifth year, it has proved to be dependable and long-lived for heavy-duty service. With proper care, each battery can replace up to 400 or more dry cells, the manufacturer states. The rechargeable feature, plus the new charger, makes it possible always to have a bright clear light when needed. This is particularly important to emergency and service crews who are called upon for equipment repair or road work in a hurry, regardless of the time of night.

Complete Line
of
DERRICKS
and
WINCHES
SASGEN DERRICK CO.
3101 W. Grand Ave., Chicago 22, Ill.

Road-Mix Project

(*Continued from preceding page*)

Smith valves and welding and cutting torches was also stored at this location for making repairs either there or elsewhere about the job.

Major Quantities

The principal bid items under this contract were as follows:

Gravel-pit stripping	392 cu. yds.
Screening and loading base gravel	2,617 cu. yds.
Hauling base gravel	12,269 cu.-yd.-mi.
Water	54 M-gals.
Motor-grader rental	25 grader-hrs.
Pneumatic-roller rental	15 roller-hrs.
Bituminous material for prime (MC-1)	7,166 gals.
Bituminous material for wearing course and tack coat (MC-3)	270,961 gals.
*Mineral aggregate	15,054 tons
Wearing course	199,341 sq. yds.

*Mineral aggregate bid included loading, screening, crushing, and hauling.

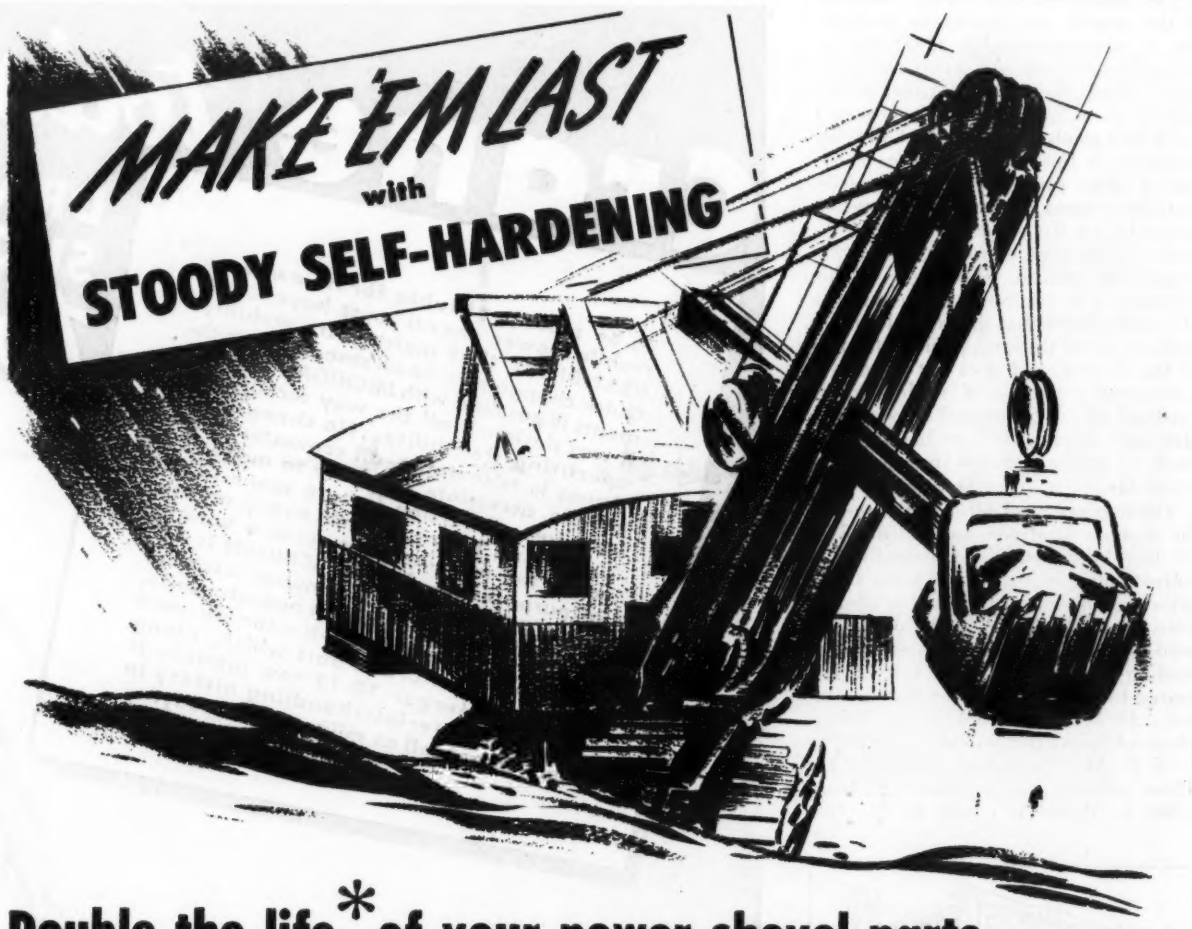
Personnel

The contract for this 12.8-mile traveling-plant-mix bituminous mat on Minnesota Trunk Highway 60 was awarded to Jud Brown and Lundeen Brothers, Mankato, Minn., on June 2, 1944, by the Minnesota Department of Highways. The contract amount was $69,964.09 and 45 working days were allowed for completion.

Ed Lundeen acted as Superintendent on the production of aggregates, with Jud Brown as his own Superintendent of bituminous operations. Roy C. Deegan was Project Engineer for the Minnesota Department of Highways, with C. L. Methven, State Construction Engineer, in supervisory charge. O. L. Kipp is Chief Engineer of the Department.

Snare Moves Offices

The Frederick Snare Corp., well known contractor, which has been located at 114 Liberty St., New York City, for the past twenty years, has leased large space on the twenty-eighth floor of the Woolworth Building which it will use for its main offices. This engineering and contracting firm has branch offices in Philadelphia; Havana, Cuba; Lima, Peru; and Bogotá and Cartagena, Colombia.



Double the life* of your power shovel parts with this economical hard-facing alloy

LIFE of all wearing power shovel parts—and your other earth-working equipment too—can be improved with Stoody Self-Hardening, a special hard-facing alloy that has twice the wear resistance of manganese steel with toughness to take severe punishment without chipping.

Where you need extremely heavy deposits for extra wear protection, 1/4" bare Stoody Self-Hardening can be applied electrically *up to 3/8" deep in a single pass*, saving the time of one complete welding operation. Used as stringers on large areas, Stoody Self-Hardening not only cuts application costs but provides wear protection comparable to solid deposits.

Stoody Self-Hardening is easy to apply, bonds well with manganese steel, provides substantial life increases to all shovel parts such as bucket parts, track pads, rollers, idlers, drive tumblers, etc.

STOODY COMPANY

1136 WEST SLAUSON AVENUE, WHITTIER, CALIFORNIA

*** It's easy to prove Stoody Self-Hardening's small cost!**

Put 100 pounds of Stoody Self-Hardening to work on your power shovel now and check the results. Available from 600 U.S. distributors at 50c per lb., f.o.b. Whittier, California, or distributors' warehouse.

STOODY HARD-FACING ALLOYS

Retard wear . . . Save Repair

Airport Grading

(*Continued from page 1*)

bottom of the bay (See C. & E. M., October, 1943, pg. 9). The greatest concentration of fill is centrally located in what appears to be a vast desert where the dredge pipe lines had poured out their material to form two large stockpiles.

Among the many contracts let for the construction of this mammoth field, Contract No. 6, for grading the six runways and central area, involving 2,400,000 cubic yards, was awarded to the Circle Construction Corp., White Plains, N. Y., on August 19, 1944. The contractor sent to the site a parade of modern earth-moving equipment which has transported the sand over the area in a great mass movement of 300,000 cubic yards a month.

Placing Sand Fill

The expanse of sand on the west half of the central area, known as stockpile No. 1, measures roughly 1,800 feet on a north-south axis and 2,000 feet east-west. Stockpile 2, lying further to the east, is about 2,500 feet long, measured north and south, and 3,000 feet wide on an east-west line. The elevation of the top of these sand borrow areas is 31 feet above mean sea level, and decreases gradually on flat slopes with even contours until the grade of the rest of the airport is reached. So slight is this elevation with respect to the great area of land covered that the central section seems to be on the same plane as the rest of the airport, and does not appear to consist of a couple of million cubic yards of fill. This optical illusion persists even when 12,000 to 14,000 cubic yards of sand are moved from this area every day.

The dredged sand fill over the rest of the meadow land now varies from 7 to 10 feet in thickness. Eventually this entire central area over which the stockpiles are now massed will be graded to Elev. 14 for the 306-acre site of the administrative area, hangars, and central loading platform. Now the fill is being moved to form the base for the six runways to be constructed in the initial phase of the airport's development (See C. & E. M., November, 1943, pg. 1). These runways, ranging in length from 6,000 to 10,000 feet, will be 300 feet

C. & E. M. Photo
A puller tractor speeded the loading of the Tournapulls at the New York Municipal Airport at Idlewild.

wide, made up of a 200-foot pavement with a 50-foot shoulder on either side. They are graded on a 1 per cent slope for 250 feet on either side of the center line. As they will encircle the central area, the movement of the fill from the stockpiles is on radial lines out along the runway locations.

Grading by Plan

Handling of the sand is no haphazard affair. A master grading plan was drawn up by Field Engineer E. J. Carrillo which divides the runways into grading sections 1,000 feet long. These sections were surveyed to determine the number of cubic yards necessary to bring each particular area up to grade, and that information was recorded on the master plan along with the number of the stockpile from which the fill material was to come. The length of haul from the center of the stockpile to the center of the 1,000-foot section was also indicated. A glance at this map shows that the maximum haul over the entire airport is 6,140 feet while the average haul is 2,860 feet.

Equipment Used

For the long hauls, from 2,500 to 6,000 feet, fourteen Tournapulls operating on big 21 x 24 tires are used, three of 11-yard capacity while the remaining eleven are 15-yard. For the shorter hauls, averaging 1,500 feet, tractors and scrapers are used. Fifteen scrapers of various makes and capacities include three 13½-yard Heils, two Gar Wood and one LeTourneau 15-yard units, three 20-yard LeTourneau Carryalls, five 23-yard LeTourneau Carryalls, and one 33-yard LaPlant-Choate. The yardage capacity is considered as a heaped load. Each scraper is pulled by a Caterpillar D8 tractor, and in addition to these fifteen there are also nine other D7 and D8 Caterpillars with bulldozers, an International TD-18 tractor with bulldozer, and an Allis-Chalmers tractor and bulldozer.

(*Continued on next page*)

SPEED WORK WITH

Fultex

TARPAULINS and WINDBREAKS

Protection when you need it can save many man hours on the job. FULTEX Waterproof Tarpaulins and Covers are well known and widely used. They have proven their quality through heavy duty and long wear. You get your money's worth when you buy FULTEX.

Quick delivery from stock on standard size covers.

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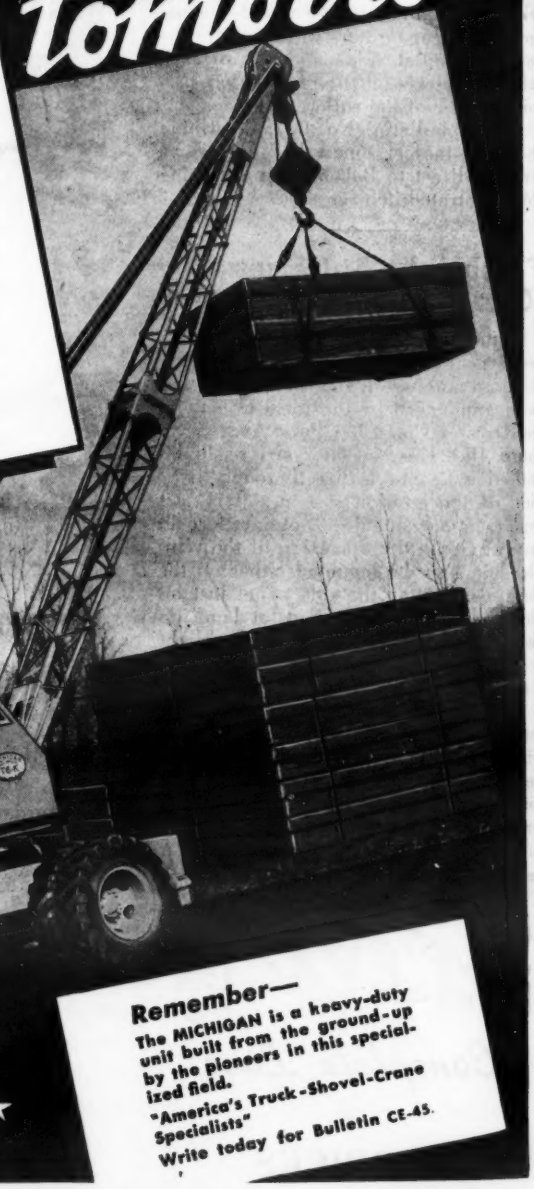
Crane today - DRAGLINE, CLAM, SHOVEL OR HOE tomorrow

To be most profitable for its owner, a mobile power shovel must have CONVERTIBILITY that matches its mobility. Quick change-over to all standard attachments is possible with MICHIGAN because it was designed all the way through for operating flexibility. No changing of drums is necessary—all connections are simple, accessible and easy to make . . . This fast-conversion feature alone saves hours and hours of time every month when the machine must serve a variety of purposes. . . Every MICHIGAN is AIR CONTROLLED—for continuous work all day at top speed and with operator-ease. . . . This is Model T-6-K—the 3/8-yard Shovel, 6-ton Crane unit which, along with the larger 10-12-ton models, is making materials-handling history in civilian as well as military use today.



Remember—
The MICHIGAN is a heavy-duty unit built from the ground-up by the pioneers in this specialized field.
"America's Truck-Shovel-Crane Specialists"
Write today for Bulletin CE-45.

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN

Airport Grading

(*Continued from preceding page*)

This last group of tractors with bulldozers is used as pushers in loading and unloading the scrapers, and leveling the material when it is dumped.

Loading Tournapulls

To speed up the loading of the Tournapulls, a novel hitch is employed on the tractors used for the short pull during loading. Four tractors are each fitted up with a 15-foot length of hollow steel tubing, 4½ inches in diameter, one end of which is a diamond-shaped opening 18 inches long x 12 inches wide, while the other end is fastened to the rear of the tractor on a pivot that permits free horizontal swinging. This long arm can also be raised or lowered by a cable and pulley suspended from a short overhead beam at the rear of the tractor. This device eliminates a tow cable and the man needed to attach it to a Tournapull, since the movement of this arm can be entirely controlled by the operator of the tractor, and he readily attaches it to the tow hook on the front of the Tournapull.

The tractor with this arm swinging in the rear awaits the arrival of the Tournapull at the stockpile. As the Tournapull comes in for a "bite" of sand, the tractor quickly maneuvers in front of it, and raises its long arm with the looped end to engage the tow hook on the front end of the Tournapull. The combined pulling power of the tractor and the Tournapull unit itself speedily picks up the load. As soon as the Tournapull is loaded, a matter of 50 to 75 feet, the tractor lowers its towing rod to disengage the hook on the Tournapull which promptly makes a sharp turn, passes the tractor, and goes rolling over the man-made desert with another load of fill for the runways. Loading in this manner saves both time and wear of machinery and tires. Pushing from the rear always means a certain amount of clutch wear and sliding of tires with side sway at the front end of the Tournapulls.

The Tournapulls move their big loads at a speed of 15 mph over fairly well beaten tracks which are kept smooth by an Adams power grader and a tractor pulling a rectangular drag made of four pieces of timber. The Tournapulls are unloaded with the help of a pusher. The tractors and scrapers move at the relatively slower speed of 3 mph and are likewise aided by a pusher or tractor-bulldozer during both the loading and unloading operations.

Drainage Ditches

As the material in the central-area stockpiles is all hydraulic-dredged sand, the water content is naturally high, and drainage has had to be provided to lower the water table and to empty pools which readily form during the excavating. Using three draglines, two Northwest 1½-yard and a Lorain ¾-yard, the contractor dug four main ditches averaging 3,500 to 4,000 feet long, about 35 feet wide at the top and 15 feet at the bottom of their 5-foot depth. These ditches start at the central area and empty into Jamaica Bay at the south and east ends of the airport. They, in turn, are fed by about ten bleeder ditches, 300 to 400 feet long, 10 to 15 feet wide and 2 to 3 feet deep, which run right up to the stockpiles to carry off the water. These smaller ditches are first made with tractor and scraper and are deepened later as needed by the draglines.

C. & E. M. Photo

A close-up of the one-man-controlled hitch on the hauling tractor.

Maintenance of Equipment

The contractor has set up a garage and shop near the center of the project where equipment is fueled and repaired. A 2,250-gallon truck brings fuel to the rolling equipment on the job and is supplied from a 5,000-gallon tank which is buried in the ground at the shop. Each piece of equipment is stopped once a day and greased by one of two grease trucks which cruise around the site. Other equipment includes a truck with air compressor for keeping tires on Tournapulls and scrapers properly inflated, two Dodge 1½-ton pick-up trucks for general hauling, and a 20-ton Tournacrane with a 32-foot boom for hoisting the heavy equipment. Four mechanics report for work one hour earlier than the rest in order to have all the equipment ready and turning over when the work day starts.

Production and Personnel

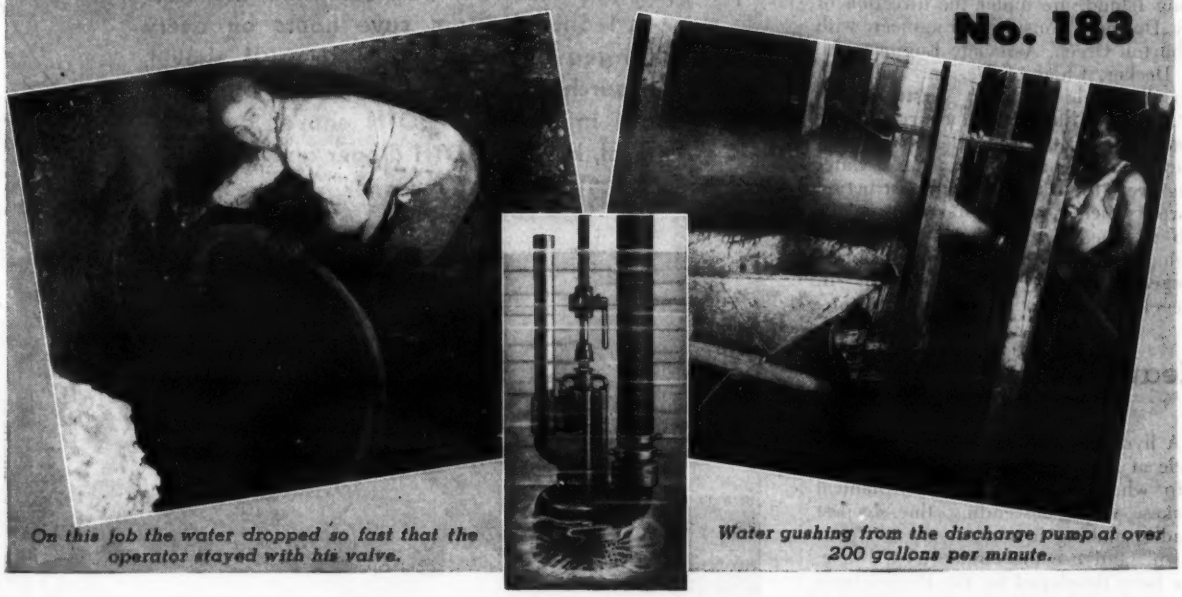
The contractor has been moving sand at the rate of 300,000 cubic yards a month, working 80 men 9 hours a day for 6 days a week. At that rate the six runway foundations will be brought to

(*Concluded on next page*)

"BICKNELL BETTER BUILT"
PAVING BREAKER TOOLS

We manufacture a complete line of tools for pneumatic paving breakers, rock drills and diggers.
Write for descriptive circular
BICKNELL MANUFACTURING CO.
12 LIME STREET ROCKLAND, MAINE

FAST PUMPING
with the CLECO-DEMING
No. 183



On this job the water dropped so fast that the operator stayed with his valve.

Water gushing from the discharge pump at over 200 gallons per minute.

THIS air operated pump has no equal for the rapid expulsion of liquids from sumps, basements, pools, ship holds, manholes, cofferdams, ditches, etc.

Weighing only 58 lbs., easily portable, the Cleco-Deming sump pump is self-priming, and operates without hesitation when wholly or partially submerged. A screen, easily removed for cleaning, prevents stones or trash from clogging the impeller. All working parts are Cammelite plated to prevent rust. Special design features insure adequate lubrication at all times. For use with oil or gasoline, a bronze body is available at slight extra cost to safeguard against sparks. Write for Bulletin 86.

While the armed services are using Cleco-Deming sump pumps extensively, our production facilities enable us to supply these pumps for commercial use also.

MEASURED CAPACITIES
With Air at 80 lbs. Gage Pressure
Against 10-ft. Head . . . 230 Gals. per Min.
Against 20-ft. Head . . . 218 Gals. per Min.
Against 30-ft. Head . . . 195 Gals. per Min.
Against 40-ft. Head . . . 170 Gals. per Min.
Against 50-ft. Head . . . 145 Gals. per Min.
Maximum Head, 75 Feet

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Birmingham 1, Ala. — Lexington 19, Ky. — Salt Lake City 1, Utah
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THE CLEVELAND ROCK DRILL COMPANY
Division of The Cleveland Pneumatic Tool Company
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LEADERS IN DRILLING EQUIPMENT

Cartoon from ETO by Cpl. Glueck

Planned Grading For N. Y. Airport

(Continued from preceding page)

proper grade by June, 1945. Engineers' estimates include the moving of 1,982,437 yards from the central-area stockpiles to the runways, and also moving 362,576 yards from high spots on the runways to fill in the low places. The total cost of the grading is $720,000. This contract was awarded to the Circle Construction Corp., White Plains, N. Y., by John McKenzie, Commissioner, Department of Marine and Aviation, who is in charge of the construction and operation of the airports owned by New York City.

The design and construction of the Municipal Airport at Idlewild, Jamaica, Long Island, are under the direction of Jay Downer, Consulting Engineer, with Wharton Green, Associate Engineer, M. T. Decker, Chief of Design, and E. J. Carrillo, Field Engineer. Lester Malms is Assistant Engineer in charge of the grading. Frank Donahue is Superintendent and George Schumacher is Chief Engineer for the Circle Construction Corp., which is also represented on the job by the four brothers owning the firm, A. V. Riegel, President; A. F. Riegel, Vice President; Edward R. Riegel and Walter J. Riegel, Directors.

Heavy-Duty Braking For Job Equipment

A hydraulic device which holds a vehicle at any desired speed, without any help whatsoever from the mechanical brakes, while descending the steepest grades, making it unnecessary to "gear down" and use the engine as a brake, has been developed by the Parkersburg Rig & Reel Co., Parkersburg, W. Va. The Parkersburg Hydrotarder operates on water supplied from the radiator through the engine cooling system and is entirely independent of the regular braking system. It is controlled by means of a choke-type rod on the dashboard. By simply pulling out on this rod, it is possible to hold the vehicle at the desired speed.

The manufacturer reports that the Hydrotarder holds the heaviest vehicles up to 100,000 pounds gross load and that it is 100 per cent safe, as it does not operate under pressure, has only one moving part, and there is nothing to get out of order.

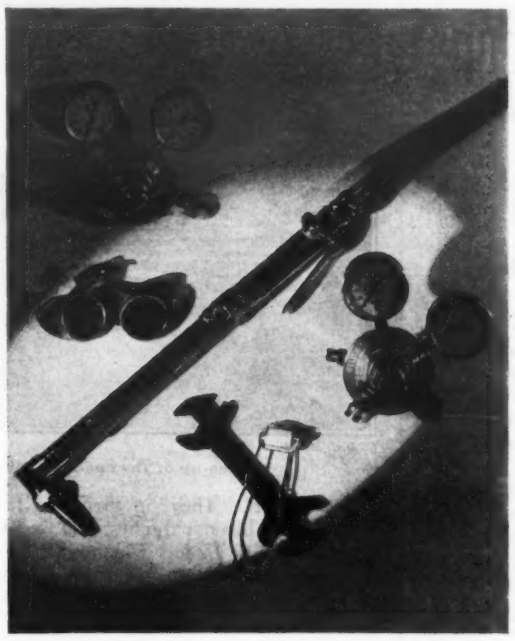
Field offices of the California Highway Patrol state that the Hydrotarder is very satisfactory since it controls the speed of vehicles at a safe rate without the use of the service brakes on down grades. A contract hauler reports that he has used the Hydrotarder for 40,000 miles and made the following savings: 25 per cent on tires, 8 per cent on fuel, 15 per cent in time, and 85 per cent in friction brakes.

Complete information regarding the Parkersburg Hydrotarder will be found in a 16-page bulletin which will be sent promptly to readers of CONTRACTORS AND ENGINEERS MONTHLY who send their requests direct to the manufacturer and mention this item.

Heavy-Duty Lubricant For Gas, Diesel Engines

A special lubricant for heavy-duty gasoline and diesel engines, which meets the U. S. Army's Specification 2-104B for engine oils, is described in an attractive 4-page leaflet just received. This Gulf Dieselube H. D. is a detergent-type oil particularly designed for severe service under a wide variety of operating conditions, and to keep motors clean and rings free. Further, according to the manufacturer, it holds carbon and sludge-forming materials in suspension, thus preventing harmful deposits in the crankcase and on rings and pistons, is non-corrosive to all types of alloy bearings, and has a high resistance to oxidation.

Copies of this leaflet, which also describes a line of Gulflex automotive lubricants and other Gulf products, may be secured by writing direct to the Gulf Oil Corp., Gulf Bldg., Pittsburgh, Pa. Just mention CONTRACTORS AND ENGINEERS MONTHLY.



This One Will Stay On the Job Longer

Often a good cutting torch prevents a costly shutdown of operations.

You cannot purchase a more dependable cutting torch—or one of wider range—than Victor.

Victor Equipment Company

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VICTOR

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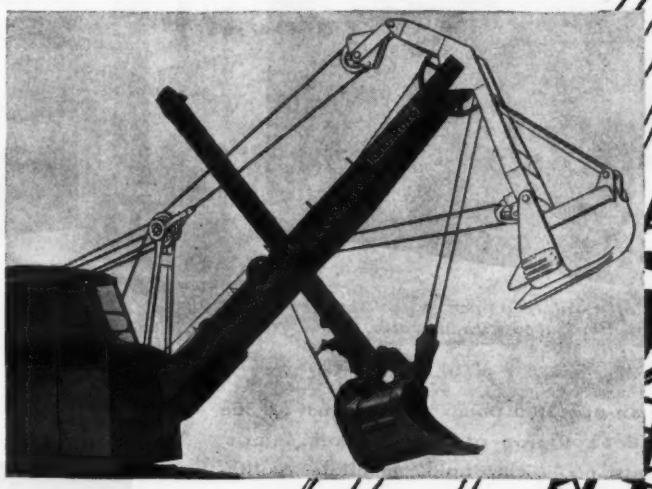
All Purpose

205

Koehring 205 Excavator is fully, easily and quickly convertible for a wide variety of job applications. Features like the new 2-in-1 Shovel Boom save hours on every changeover from shovel to pull shovel, cut purchase cost as well. The SAME boom stays in place on BOTH shovel and pull shovel, handles BOTH dipper and back hoe.

KOEHRING CO • *Milwaukee 10, Wis.*

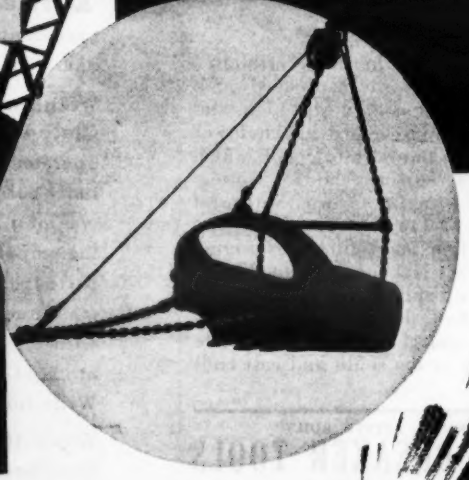


AS CLAMSHELL OR LIFTING CRANE:

Material handling or setting steel is easier with the 205. Steel goes up right . . . off the stock pile fast, then inched into place without jockeying, smooth, fast acting controls simplify accurate clamshell spotting.

AS DRAGLINE:

Tops for drainage work because reserve power outpulls suction, fairlead saves drag cable, traction brakes STOP when you want STOP, fast acting clutches and brakes produce longer bucket casts.



Orders Accepted Now . . . for Post-War Delivery

ARMY E NAVY

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Town Garage a Key To Good Maintenance

Town of Greece Garage Repairs Road Equipment For Use on Highways in Monroe County, N. Y.

+ UNDER the road maintenance system used in Monroe County, New York, the nineteen townships comprising the county play an important part in keeping the roads in good condition. Not only do the town maintenance forces look after their own town roads, which average about 30 miles to a town, but they also work on county roads. The latter, together with state highways, are included in contracts for snow removal. Each town has its own complete road-building unit, the size of the unit varying with the size of the town. In small rural townships, equipment may be limited to a few trucks and a roller. The Town of Greece, with a large road mileage, has a well equipped garage to service the modern highway equipment for use on its roads. Emmett V. Cooper is Town Superintendent of Highways.

In the spring, town maintenance forces look after the construction or reconstruction of their own roads. About July 1, they are taken on the county payroll and the town superintendent becomes the county road foreman. From then until November, they work on county roads only. With that work completed, they go back to the town roads again just in time to begin the erection of snow fences.

Snow removal on town roads is the responsibility of the town crew, but the town is paid $110 a 2-lane mile by the County to keep the county roads and state highways free of snow. The County in turn is reimbursed $75 a mile by the State Department of Public Works for snow removal on state highways lying within the county. Under this system, the County makes up the difference in what it pays to the towns for snow removal on state highways. In this manner, town truck and equipment operators are kept working the year round without too great a financial burden on the individual town.

Greece Highway Garage

The maintenance center in the Town of Greece is the highway garage on Long Pond Road northwest of Rochester, N. Y. The main wing is long and narrow, 120 x 40 feet, with plenty of natural light. The garage, which was built in 1933-35, has concrete-block walls, with its long dimension on a north-south line. At the northeast corner, a wing 40 feet wide extends 90 feet to the east, giving the garage the shape of an L. This wing has a dirt floor and is used for the storage of trailers, trucks, and other heavy equipment. Another wing 60 x 30 feet long projects from the southwest corner of the main wing. To the west or rear is a storage yard for equipment, while to the east or front of the building is the large entrance yard.

The main wing has a concrete floor, while the roof is wood covered with tar paper. At the south end of the building is the machine shop which is entered through a 15-foot-wide overhead door with 10 feet 4 inches clearance. The shop itself is 12 feet high and is equipped with a 2-ton Reading chain hoist on a monorail supported by the overhead roof beams. To the left on entering is a mechanics' work bench, 22 feet long x 3 feet wide x 3 feet high, made of wood and covered with steel plate. The mechanics provide their own tools but the bench is furnished with vises, air outlets, and overhead lights.

The shop is further equipped with a 12-inch x 10-foot lathe, a Sterling power hack saw, a 1¼-inch drill, and an emery wheel, all driven by a 4-hp Westinghouse electric motor. Two welding outfits are also in use, an Airco-Davis acetylene unit and an electric welder. Two unit heaters and two 100-watt overhead bulbs furnish heat and light. The machine shop is 40 feet square but a small section in the northeast corner is set aside for an office with a separate outside entrance.

To the rear or west of the machine shop is a 30 x 40-foot storage room where equipment parts, tires, chains, etc., are kept. Adjoining the storage room to the north is the boiler room where a coal-burning steam boiler supplies the garage with heat. Next to the boiler room is the wash room complete with hot and cold water, showers, sinks and lavatories.

C. & E. M. Photo
In Monroe County, N. Y., county highways are taken care of by the towns. This is the well equipped garage of the Town of Greece.

North of the machine shop and running the length of the building is the main part of the garage which has storage space for eight trucks. Eight individual overhead doors open into the front yard. A monorail crane hung from the steel roof I-beams runs the length of these eight stalls and is capable of lifting a 4-ton load. Three McCord-Detroit unit heaters are suspended from the ceiling for heating, while sixteen lights, two to each bay, furnish ample illumination. Along the rear wall are outlets for compressed air and for the portable electric welder. A Kellogg compressor supplies

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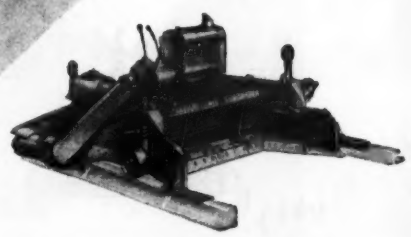
12,000
LINEAL FEET OF FINISHED
25 FOOT SUBGRADE
IN
8
HOURS



THAT'S A BROAD CLAIM TO MAKE!
But it's based on fact—an actual job record of the STANDARD-LEWIS Subgrader on four 25-foot runways that had to be built in a hurry. In this speedy operation, the STANDARD-LEWIS Subgrader bailed material at the rate of 8 yards per minute and produced a finely finished and accurate subgrade from side form to side form.

FEATURES
1-Quickly adjustable to variable digging depths. 2-Cuts in either direction without turning. 3-Works around curves without binding and tows sideways through narrow places. 4-Digs right up to the side forms, eliminating hand cleaning. 5-Simple lever adjustment for spoiling at either side.

OTHER STANDARD PRODUCTS
ASPHALT PLANTS • BATCHING PLANTS • ASPHALT FINISHERS • CONCRETE FINISHERS • LOADERS ROLLERS • POWER BROOMS

GET THE WHOLE STORY—
SEND FOR THIS BULLETIN

STANDARD
STEEL CORPORATION
General Offices and Plant: 5001 South Boyle Avenue
Los Angeles 11, California
Distributors Throughout United States and Canada

The new CMC 6-inch pump.

A 6-Inch Self-Primer Added to CMC Line

A new 6-inch self-priming centrifugal pump rated at 90,000 gallons per hour has been announced by Construction Machinery Co., Waterloo, Iowa. The manufacturer reports that the added efficiency of this new unit is accomplished by a new mixed-flow impeller, and particular care in the design and proportioning of the volute. The pump has a triple self-adjusting shaft seal and is available with an improved flexible coupling drive and a heavy-duty engine as well as with a 1,800 to 1,200-rpm electric motor or diesel engine.

Complete information regarding this new pump may be secured direct from the manufacturer by mentioning this illustrated news item.

Granite for Masonry

Two new bulletins on granite for heavy masonry in bridges, piers, foundations, dry-docks, sea ramps, etc., for curbs and for paving, have recently been issued by the H. E. Fletcher Co., West Chelmsford, Mass.

Copies of these bulletins will be sent promptly to readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to the producer at West Chelmsford and mention this notice.

Town Garage

(Continued from preceding page)

air at 180-pounds pressure.

There are no grease pits in this garage but a Weaver vertical lift capable of raising 20 tons is used for greasing. Kendall oil and Texaco grease are used on the equipment. In the north corner of the garage is a blacksmith forge and anvil. An Aeroil burner is used for melting and heating tar and asphalt. Another useful piece of equipment is a Hypressure Jenny for steam-cleaning equipment.

North of the main wing a small section, 15 feet wide x 40 feet deep, is set aside for painting. This is walled in and has its own outside door for the trucks to enter. Adjoining the paint shop to the north is a 40-foot square room which is used for storing snow fence. The garage is completely equipped with Phomene fire extinguishers.

Concrete-Block Ballast

A large number of concrete blocks have been made by the town forces to serve as ballast in trucks during snow plowing. These blocks, 3 x 3 x 1-foot, weigh 900 pounds each and are made with a projecting eyelet so that they can be easily hoisted into the trucks by the overhead crane. Two of these blocks in each truck provide sufficient traction when out fighting the snow. For this purpose in the past, the trucks had been filled with cinders which method is considered rather unsatisfactory.

Town Equipment

Some of the equipment which is stored and serviced in this garage are 12 trucks, ranging in size from 3½ to 10 tons, mostly Stewarts and Macks; 3 John Deere and a Fordson tractor; an Austin-Western 10-ton, a Galion 4-ton and a Galion 10-ton roller; 2 Schramm compressors; 8 pumps; a La Crosse 20-ton trailer; a Galion grader; 2 chip spreaders; 2 paint machines, one for road striping and the other for spraying posts; and a Briggs & Stratton-powered mower.

Acme Enlarges Plant

Acme Wire & Iron Works, San Antonio, Texas, manufacturer of Ingram road rollers, road-building machinery, rock crushers, and other equipment, as well as diesel-powered crawler-type cranes, shovels, and draglines, and farm equipment, has recently completed a new factory building for its anticipated increased production. In a recent statement, Hudson B. Ingram, Secretary, said that Acme plans to expand into markets to the west and south of San Antonio where freight rates are extremely favorable, without withdrawing from other territories.

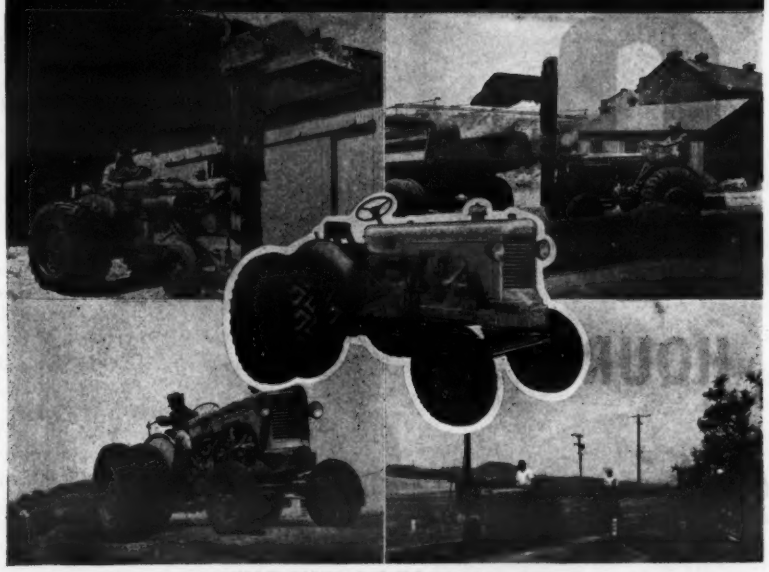
TESTED and APPROVED for use on high tensile strength wire rope, by Underwriters' Laboratories—official testing laboratories for insurance companies.
ONE SAFE-LINE CLAMP is designed to hold any wire rope without slipping.
WIRE ENDS ENCLOSED. No needle-sharp wire ends, nuts and bolts exposed to injure workman's hands.
STREAMLINED! Will not catch on clothing nor on mechanical apparatus. Will not foul.
HOLDS A TIGHT THIMBLE. When thimbles are used they will not loosen and fall out.

SAFE-LINE
WIRE ROPE CLAMPS

Write for details of this—the only PERFECTED wire rope clamp on the market. Millions used by manufacturers, the Armed Forces and industries.

NATIONAL PRODUCTION COMPANY
4559 ST. JEAN AVENUE DETROIT 13, MICHIGAN

"BUILT" to do the JOB



It's PERFORMANCE that Counts . . .

"Know-How" are small words but they have a *big meaning* in the manufacture of *industrial tractors.* "Know-How" and "Built to do the Job" are synonymous in building *MM Industrial Tractors.* The dependability, durability and low operating cost of MM Industrial Tractors is widely known. MM Industrial Tractors are built not only to pull graders, scrapers, packers and tampers but are also versatile enough to be adapted to loaders, cranes, snowplows and bulldozers. The short turning radius, good traction, high road speed, heavy-duty engines, special heavy-duty front axles, steering gears and counter weights make them ideal to "fit in" on the hundreds of jobs in any road or highway program. MM Industrial Tractors have a power range of from 27 to 64 brake HP on 70 octane gasoline and are built for *real power without sacrificing* operating economy and long life performance.

MODEL	ENGINE	BRAKE HP ON 70 OCTANE GASOLINE	FORWARD SPEEDS	MILES PER HOUR
RTI	3⅛ x 4-4 cyl.	27	4	2 to 11
UTI	4¼ x 5-4 cyl.	48	5	2.2 to 18
GTA-I	4⅛ x 6-4 cyl.	64	4	2.5 to 10

MINNEAPOLIS-MOLINE POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA, U. S. A.

Spring maintenance determines Summer road service

Substantial Road Improvement is the reward of the highway official who conditions his gravel roads early, while moisture is still available for proper shaping and compaction. Further reward comes to those who apply calcium chloride early to hold the moisture which binds the fine cementing materials. This work should be done before these essential binder soils are blown away as dust.

Too little has been said about the use of calcium chloride to prevent evaporation of the roadbed moisture—so essential to maintain compaction. Early road conditioning and early application of calcium chloride will work wonders. Bulletin 29 tells how—it is sent on request.

CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Bldg., Detroit 26, Mich.

Dust is the cement in your gravel road
Save it with
CALCIUM CHLORIDE

Official U. S. Army Photo
Men of the Ninth Air Force Engineers using a "stamp-licker" to lay Hessian mat as a landing surface on a well graded and compacted subgrade.

Laying Hessian Mats On Forward Airfields

Hessian mats are a Canadian-British development of burlap-like material made out of Indian jute, and are placed in two layers, the bottom of each layer being impregnated with asphalt, to produce dustless airfield surfaces. Not until about one month before D-Day was all of the grief removed from their use. It had been assumed that these flexible waterproof Hessian mats did not require fine grading and compaction, but this produced unsatisfactory results. Ninth Air Force Engineers, however, constructed an entirely successful landing field by using Hessian mats as a surfacing over a well graded and compacted area. An improvement in the bond further reduced the danger of soft spots due to the entry of water beneath the mat.

The Hessian mat comes in rolls 100 yards long and 36 inches wide and is run through a "stamp-licker" consisting of a series of rollers and a rotating drum filled with 50 per cent RC-3 and 50 per cent gasoline. As the stamp-licker moves along, the mat is unrolled and is completely gummed on the bottom side. The second layer overlaps the first by 50 per cent. Generally the strips are "shingled" in from the shoulders to a seal-strip at the crown but occasionally it is necessary to shingle across the entire runway to protect a sloped surface.

Hessian, which covers a great number of the airfields in France, can be laid about as fast as square mesh, and faster than steel pierced plank. A 5,000-foot runway requires about 16 hours for an experienced unit as against 20 hours with pierced plank. In addition, its surface gives better traction and braking than that of any of the other landing strips and is mud and dust-free. It is also easier on tires, though turning areas have to be covered with square mesh to avoid the tearing effect of planes which lock one wheel and spin on it. A further advantage of Hessian is that only 850 tons of material are required to cover a normal-size runway as against 4,000 for pierced plank.

The original estimate for the life of a Hessian-covered operational field was 60 days, but at the end of this period on the first Hessian-covered field, where 300 loaded C-47's were landing and taking off every day, the surface showed no appreciable wear. Small repairs can be made by two men, a mop, a bucket of asphalt, and a roll of material. The area to be repaired is swabbed, the mat laid, the men walk across it to press it onto the existing mat, and the patch is completed.

There are also disadvantages to the use of Hessian, and these began to show up as the European campaign moved into its winter season. It cannot be laid either in rain or in wind greater than 15 miles per hour. At a temperature below 45 degrees F, the material will crack, check, and distort, making it impossible to secure a satisfactory bond. In winter operations, therefore, the all-weather pierced-plank landing mat is used almost exclusively in new construction. In a few heavily used key fields, only pierced plank has been used, to insure all-weather operation.

New Electric Drill Lighter in Weight

A new development of Thor Armored-in-Plastic portable electric drills, which introduces a side-handle type 20 per cent lighter than comparably rated drills with aluminum castings, has been announced by the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill. The new side-handle-type Thor drills are identical in construction with the original Armored-in-Plastic pistol-grip machines, except for the handle, and are available in three speeds, 2,500 rpm, 3,750 rpm, and 5,000 rpm. Each drill weighs 3½ pounds and is 7 9/16 inches in length.

The gear case, field case, and handle of these Thor drills are molded in the specially developed Thorite plastic which has surpassed performances of heavier metal housings for durability and cool easy handling, the manufacturer states. All internal operating parts are supported in a metal frame entirely separate from the plastic housing, making an independent unit so constructed that the tool will operate perfectly with all housing detached.

Complete information and prices on these latest Thor Armored-in-Plastic drills are contained in Bulletin No. E-806, copies of which may be secured direct from the manufacturer. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

HEAVY DUTY MACHINERY TRAILERS
LA CROSSE TRAILER & EQUIPMENT CO.
LA CROSSE WISCONSIN

Lightweight*

MOVES MORE MATERIAL

..... FASTER

★ 20% TO 40% LIGHTER THAN OTHER BUCKETS, type for type.
★ ALL WELDED CONSTRUCTION for greater strength and durability.
★ MANGANESE STEEL chains, fittings, and reversible tooth points.
★ GETS FULL LOAD PAY MATERIAL EVERY TRIP —even in wet digging.
★ 3 TYPES—light, medium, and heavy duty—⅜ to 30 cubic yard size.

Also available **WITHOUT** *perforations*

WRITE FOR DESCRIPTIVE LITERATURE— OR ASK YOUR DEALER

HENDRIX Lightweight DRAGLINE BUCKETS

DESOTO FOUNDRY, INC. · MANSFIELD, LOUISIANA

Conn. Governor Seeks $10,000,000 for Roads

If the General Assembly of the State of Connecticut approves the budget presented by Governor Raymond E. Baldwin, the State's highway program will be larger than for the past two years. The Governor has asked the Legislature to vote $130,040,490 for the two-year budget. This is an increase of $12,501,071 over estimated expenditures in the current biennium and most of the increase is in funds for highway work.

The budget, which covers a biennium, contemplates one more "war" year with only about $1,000,000 of construction, to be followed by a year with about $6,000,000 of construction. Pre-war construction averaged $11,000,000 over an eight-year period.

The proposal for a one-cent increase in the gasoline tax would add about $4,000,000 a year for construction and would bring Connecticut back approximately to the pre-war level.

New Condensed Catalog On Machine-Shop Tools

A suspended swing-frame grinder, V-belt driven with two speeds from 5,600 to 10,000 sfpm, for tool grinding, buffing and polishing; oilstone grinders in three sizes, incorporating five basic units in one; radial grinders with their own supporting base and carriage; facing heads in sizes from 6 to 46 inches; and boring heads in eight sizes from 5 to 15½-inch diameter are among the shop equipment described and illustrated in a 12-page folder available from Mummert-Dixon, Inc., Hanover, Pa. This company also offers complete pattern service for all kinds of castings. The back of the folder lists the complete literature on these and allied types of equipment made by this company.

Copies of the folder, and of the various complete catalogs, may be secured upon direct application to the company.

Macwhyte Sales Mgr.

The appointment of R. P. Tyler as General Sales Manager has recently been announced by the Macwhyte Co., wire rope manufacturer, of Kenosha, Wis. Before joining the Macwhyte Co., Mr. Tyler was connected with the Sales and Engineering Departments of John A. Roebling's Sons Co. of Trenton, N. J., and was Sales Manager of the A. Leschen & Sons Rope Co., of St. Louis, Mo.

H. E. Sawyer, who was formerly General Sales Manager as well as Vice President and Treasurer of the Macwhyte Co., will continue as Vice President and Comptroller.

Building better FARM TO MARKET roads will have no small bearing on the nation's prosperity for many years to come. Not only do they provide direct and indirect employment but they are essential to the livelihood, food, clothing, shelter, education and social contacts of millions. Good country roads have long been credited with raising the standard of living and increasing the efficiency of the farmers which, in turn, has meant better living for all.

Better country roads will be built because modern machinery can turn out better materials at lower cost, saving money to build many extra miles. The Cedarapids Junior Tandem is a highly portable plant which can be easily moved about to economically produce, *on the job*, the aggregate in the smaller tonnages required for individual country road jobs. Their low first cost, high efficiency, long trouble-free operation and their ability to handle a wide range of jobs mean more miles of better roads at less cost. Your Iowa dealer will be glad to tell you more.

IOWA MANUFACTURING CO.
Cedar Rapids, Iowa

Cedarapids
Built by IOWA

THE IOWA LINE
of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS—STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS—TRAPS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

Steel-Girder RR Bridge Over Detroit Expressway

Concrete-Pile Foundation For 156-Foot Skew Span To Carry NYC Main Line; Built by Meagher & Sons

✦ OF the sixty-one bridges on the $26,000,000 Detroit Industrial Expressway (See C. & E. M., January, 1945, page 41), one of the most interesting is the recently completed $1,035,000 grade-separation project which carries eight tracks of the New York Central Railroad's main line over the depressed section of the highway in the city of Dearborn, just west of the Detroit city line. To provide a solid foundation for the massive concrete abutments and center pier, 872 concrete piles up to 103 feet in length were driven. Structural steel in the superstructure consists of 68 individual girders 78 feet long.

The bridge was built as part of the Michigan State Highway Department's Detroit Expressway project which has eliminated all crossings at grade either of highways or railroads in the 34-mile length of the Expressway from the Detroit city line westward to the Willow Run Bomber Plant. The limited-access non-stop high-speed throughway, with its double 24-foot-wide concrete pavements, connects with U. S. 23 just west of Ypsilanti.

This railroad bridge, which carries the Detroit-Chicago passenger and freight traffic of the New York Central, was built under the direction of Michigan State Highway Department engineers by W. J. Meagher & Sons, contractor of Bay City, Mich., for $741,216.13. The structural steel and railroad-track materials were furnished under separate contracts. The substructure was designed by the Michigan State Highway Department, while the steel superstructure was designed for E72 loading by New York Central Railroad engineers. This bridge is located about a mile west of the present terminus of the Expressway at Michigan Avenue and Wyoming Road at the Detroit city limits. The final 2½-mile stretch of Expressway, which is depressed, passes under five railroads and four major highways. In this section the Expressway runs in a northeasterly direction while the New York Central Railroad is almost due east-west. As a result, the bridge was built at an angle of 48 degrees 22 minutes with the Expressway.

Temporary Track

Before construction of the bridge could begin, provision had to be made for the two main-line and four of the freight tracks of the railroad so that traffic would not be interrupted during construction operations. A core was left in the cut immediately south of the bridge site and the tracks were moved to their temporary position one by one, beginning with the track furthest south so that no crossing over was necessary. Six miles of rail, or 3 miles of track, and ten switches, including eight cross-overs, were moved to this ½-mile-long detour. Nordberg track-equipment power tools were used in these operations. This temporary track was designed and built with superelevation and spiraled curves so that trains could operate over it at a speed of 75 miles per hour.

Pile Foundation

Excavation for the footings was done by a Page 1¼-yard dragline and a Northwest No. 7 shovel, assisted by an International T-40 with bulldozer. The earth cores between the footings of the abutments and the center pier were not removed until construction of the substructure was complete in order to counteract the pressure from the approach fills.

Footings for the 184-foot abutments and center pier rest on 872 Raymond concrete piles from 82 to 103 feet long. These piles consist first of a 10-inch steel shell 50 feet long and capped at the lower end. Subsequent lengths are of telescoping corrugated-iron sections increasing 1 inch for every 12 feet to the maximum of 15 inches at the top of the pile, and were filled with concrete after driving. These steel shells were driven to refusal by two Marion steam cranes operating steam pile hammers working in 96-foot leads, so arranged that the piles could be driven at any angle. At the outer edge of the wing-wall footings a double row of piles was driven battering out, while a single row was set at the

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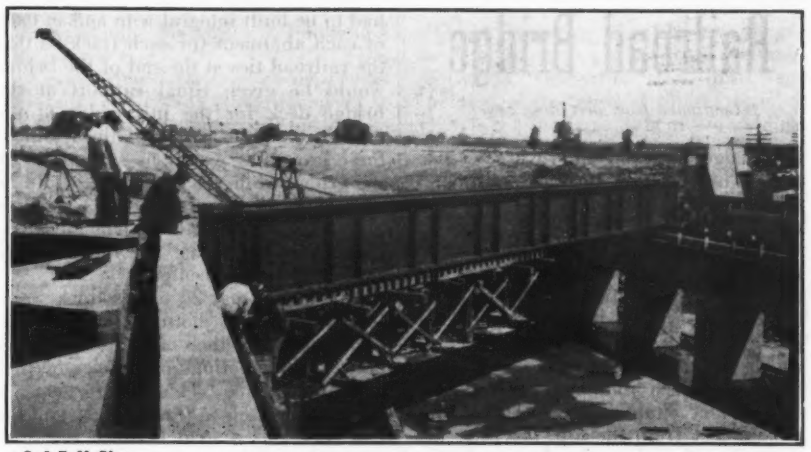


C. & E. M. Photo

The 78-foot girders for the railroad bridge carrying the New York Central Railroad tracks over the Detroit Industrial Expressway were moved from the flat cars to position on the bridge seats by a tractor.

power...
for crushing rock

The demand for "tomorrow's engine today" calls for more horsepower per pound and per inch.

There are different ways of increasing the power of an engine—by speeding it up, by increasing combustion pressures . . . but BUDA achieves this goal through *greater piston displacement* with no greater weight or size. Longer life is assured through the low pressure Lanova combustion principle.

This, like all BUDA improvements, is born of long and wide experience—through 64 successful years of making better equipment to do a better job.

BUDA engines are now available for essential industries. Write or wire today for complete information.

BUDA

BUDA Nozzle Testers

15412 Commercial Avenue
HARVEY (Chicago Suburb) ILLINOIS

BUDA "All Purpose Jacks"

Railroad Bridge

(*Continued from preceding page*)

inner edge, battering in. A greater batter was necessary on the outside to offset the earth pressure on the inside of the walls.

The shells were filled with truck-mixed concrete to the elevation of the bottom of the footings. The concrete trucks were driven to the site and the piles filled by means of a short chute which emptied into a funnel placed at the top of each pile shell with an elephant-trunk chute down into the pile. For 15 feet from the top, the piles are strengthened with a circular steel cage having six ¾-inch vertical reinforcing bars.

Footings

The bottom of the abutment and pier footings is 6 inches below the top of the concreting in the pile casings with dowels from the pile reinforcement extending 2 feet 9 inches above the top of the pile. The abutment footings are 17 feet wide and that of the center pier 15 feet wide. The distance from the face of each abutment to the center line of the pier is 55 feet 1¼ inches. Because of the skew on which the bridge is built, the normal distance between abutments, measured through the center pier, is 110 feet 2½ inches, although the span of the girders is 156 feet, divided by the center pier into two spans of 78 feet. For this same reason, while the abutments and pier are 184 feet long, the distance across the bridge between the center lines of the fascia girders is 118 feet. Also because of this skew, triangular-shaped tie piers had to be built integral with and in back of each abutment for each track so that the railroad ties at the end of the bridge would be given equal support at the bridge deck for the full width of the cross ties. Otherwise half the width of these cross ties would be supported by the bridge while the other half would be carried by the approach fill. The two built-out sides of these triangular tie piers are 10 feet long and the piers are spaced 13 feet on centers.

A concrete mat 24 inches thick, reinforced top and bottom with 1-inch-diameter bars 1 inch on centers, extends between the footings of the center pier and abutments. The reinforcing is spliced to dowels in the footings, and the mat serves as a strut between the footings to resist forward movement of the abutments as well as upward pressure from the clay beneath. It also serves as a sub-base for the Expressway paving.

Abutments and Center Pier

The abutment walls are 7 feet 2 inches thick while the center pier is 5 feet thick. They are 12 feet 5 inches and 15 feet 1 inch high, respectively, to provide a 14-foot vertical clearance between the roadway and the bottom of the girders. The center pier consists of eleven columns spaced 15 feet 10 inches on centers and 15 feet 1 inch high including the top beam. The end columns are 7 feet 5 inches wide while the remainder are 5 feet 6 inches wide. All columns are 5 feet thick. The beam section which caps these columns is 6 feet 3 inches high and 5 feet thick.

Forms for the concrete pour on abutments and pier were made of ¾-inch plywood in 4 x 8-foot sections, and were braced by 2 x 6-inch studs on 1-foot centers. These in turn were supported by two 2 x 6-inch wales on 2½-foot centers. The ties were ⅜-inch round rods held in place with Williams clamps. The forms were cut and trimmed by a 24-inch Greenlee power saw.

The batching plant located at the bridge site included a Butler silo bin for storing bulk cement, which was transported from Medusa, Ohio, in bulk-cement cars. Sand and stone were hauled from the Inland Lime & Stone Co. in Detroit. The coarse aggregate used was a limestone rock which was quarried in the upper Michigan peninsula and delivered by boat to Detroit. A Northwest 104 crane with a clamshell bucket fed the C. S. Johnson aggregate batcher.

Concreting

The basic mix of the concrete by weight was as follows:

Sand	304 lbs.
Stone	359.5 lbs.
Water	53.6 lbs.
Cement	94 lbs.

This basic mix would make only 0.2 cubic yard of concrete but the mix used in the Rex 27-E paver was a 4½-sack batch proportioned by weight. A single 1½-ton batch truck was used; the sand, stone, and cement were batched in that order and then dumped into the paver skip. When mixed, the concrete was delivered to the forms by a Rex Pumpcrete at the rate of 20 cubic yards per hour. Two Mall vibrators were used in the forms.

The abutments were backfilled with slag and cinders in equal proportions, using an International TD-14 tractor with a bulldozer. As slag weighs 83 pounds and cinders weigh 53 pounds to the cubic foot, this combination was desirable from the viewpoint of lightening the load of material and keeping it below 75 pounds to the cubic foot.

Structural Steel

The superstructure consists of sixty-eight 5-foot-high girders each 78 feet long and spaced 3 feet 3 inches on centers. The outside, or fascia, girders are 8 feet 6 inches high. The fascia girder on each side carries no live load; consists

(*Continued on page* 55)

You won't find GENERAL EXCAVATOR listed in the Mortality Tables!

EVERY GENERAL BUILT SINCE 1927, ON WHICH THERE IS A RECORD, IS STILL AT WORK!

It's a fact! Every General Excavator built during the past 18 years, on which we are able to check, is still in action; doing a good day's work every day. Our records cover 98% of all Generals manufactured; the other machines are those sold by their original owners and on which we do not have recent information.

That's the kind of a performance record that has built confidence in General Excavators and Supercranes . . . confidence that will mean even more Generals at work during the postwar era. Include General in *your* postwar equipment plans! Get all the facts about the complete General line and be sure to inquire about the revolutionary new . . .

GENERAL TYPE 10

Combination Crane, Shovel, Dragline and Backhoe—One Man Controlled—One Engine Operated—On Rubber Tires

Postwar Priority Orders Now Being Booked

BUY MORE WAR BONDS AND KEEP THE BONDS YOU BUY

THE OSGOOD CO. SHOVELS, DRAGLINES CRANES GASOLINE & DIESEL ENGINES DIESEL, OIL, GAS, ELECTRIC

Associated with The Osgood Company

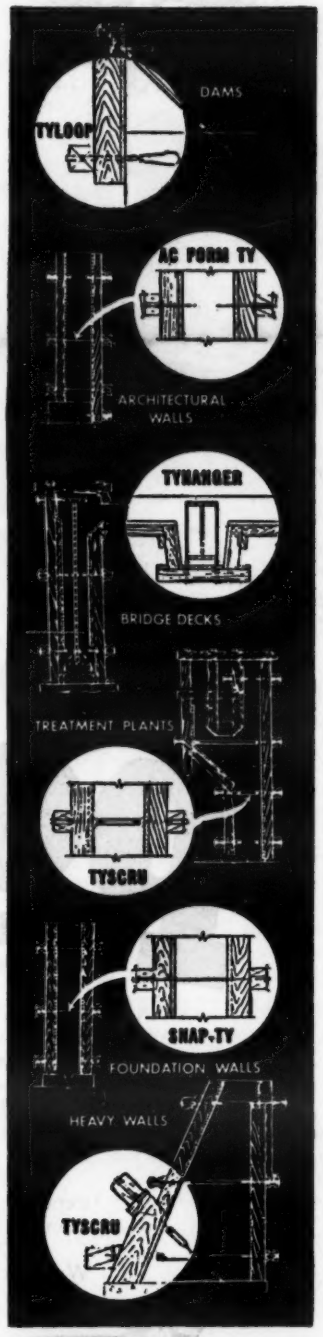
GENERAL EXCAVATOR CO.

MARION, OHIO

CRANES, DRAGLINES AND SHOVELS

RICHMOND PRODUCTS

— FOR CONCRETE WALL-WORK



CORRECTLY ENGINEERED TO SAVE TIME AND LABOR ON YOUR JOB!

CONCRETE WALL WORK BUILT WITH RICHMOND PRODUCTS *Costs Less* THAN WALLS BUILT WITH WIRE, BAND OR ROD TIES

Richmond's Tyscru principle is that of a wire coil wound to the contour of a lag thread to receive and develop the full strength of the Richmond Tylag bolt. This bolt, by reason of its simple construction and fast thread, can be re-used indefinitely with no depreciation. For instance . . . ½" diameter Richmond Tyscrus have a 5 turn coil (resistance welded) to each end of high tensile wires. These coils are 1" in length, hence they have 5 threads per inch as against 13 machine threads per inch on other tie systems. This is an immediate saving of better than 50% in tightening and stripping time per tie.

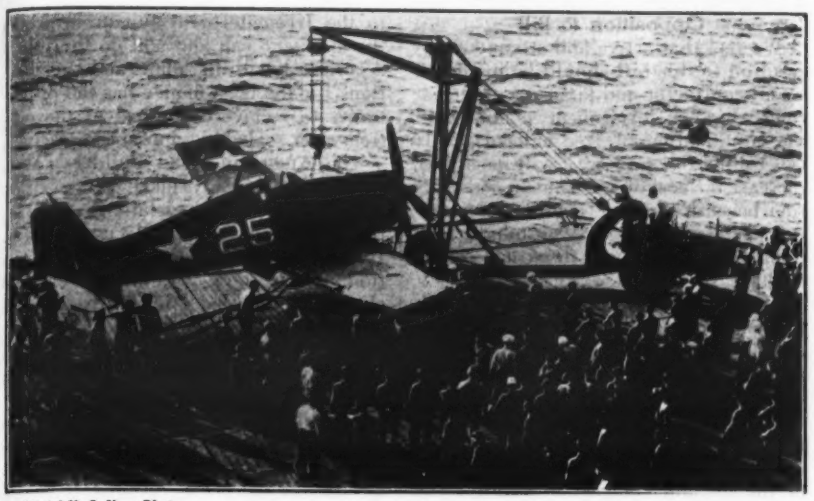
Richmond's policy of loaning its Form-Tie working parts (tools) free of any rental charge is a big factor in reduced costs because you only pay for lost parts, not for their *usage*.

SEE OUR CATALOG IN SWEET'S

JOB ESTIMATES AND FORM-TIE DETAILS SUPPLIED • WORKING PARTS LOANED

RICHMOND SCREW ANCHOR CO., INC.

816-838 LIBERTY AVE. • *Manufacturing Since 1911* • BROOKLYN, N.Y.



Official U. S. Navy Photo

A Tournacrane on a Special C Tournapull serves as a "mobile crash crane unit" aboard a first-line aircraft carrier in the South Pacific.

Tournacranes Tour On Navy Flat-Tops

The story of how some of the Tournapulls at Pearl Harbor were converted into mobile cranes which eventually became standard equipment on Navy flat-tops is almost fantastic. It started prior to December 7, 1941, on a heavy-construction contract of Hawaiian Constructors for which Vern Jeffers was General Master Mechanic. The fleet of equipment he had to look after included forty-one heavy pneumatic-tired Tournapulls. In order to take care of the many heavy lifts, Jeffers converted two of these Tournapulls to Tournacranes by removing the scraper and substituting a LeTourneau tractor crane, but with the added advantage of speed and of pneumatic tires which can travel anywhere trucks can go.

These flexible crane units proved to be exceedingly useful, particularly after the Jap attack had left the harbor and airfield a shambles. Bulldozers had pushed destroyed planes off Wheeler Field into the ravine in order to clear the field for action. The big cranes untangled the masses and lifted them up for salvage. Dismounted guns had to be remounted and new guns installed around the island. The cranes lifted them into place as easily as a Marine shoulders his rifle. They were also used for unloading railroad flat cars carrying the loads away as quickly as they lifted them from the car. When trucks ran off the road and were wrecked during blackouts, these cranes set them back on the road, load and all, or brought them in.

In charge of the rigging crew engaged in salvage in Pearl Harbor was Commander Miller of the Navy. He had watched these cranes in their versatile activities and one day brought Admiral Nimitz and other high officers to see the cranes put through their various paces, which included making a 35,000-pound lift.

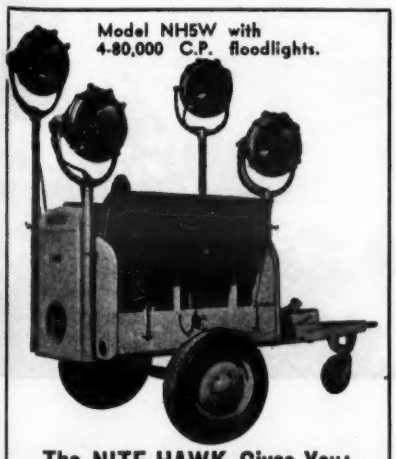
A short time later, one of the cranes was borrowed by the Navy, lifted on to the flat top of the Saratoga and driven around to test its maneuverability. A gaping hole had been made in the deck by a Jap bomb and a plane lodged in the hole. The first job of the Tournacrane on shipboard was to lift out this plane. Now all carriers have one of these cranes as part of their standard equipment for the fast handling of plane crashes on deck.

Progress of Arc Welding In New Technicolor Film

The history of arc welding from its beginnings to its present dramatic wartime role and its place in future industrial development are shown in a new Technicolor film with sound just released by The Lincoln Electric Co., Cleveland, Ohio. Produced at the request of the U. S. Bureau of Mines and under the technical direction of Lincoln welding engineers, the film was staged and photographed in airplane factories, shipyards, refineries, steel mills, and includes shots taken at Shasta Dam. It depicts the fundamentals of arc welding, types of welded joints and, for the first time in actual photography and animation, the true action inside the arc, with close-up views of the penetrating arc force.

Entitled "Magic Wand of Industry—Arc Welding", the film was primarily designed as a source of education and information. It is also intended as an inspiration to attract men and women into the many arc welding jobs in war plants. Business and engineering groups, technical associations, schools, and colleges may secure prints of the film, available in 16 and 35 mm, for the cost of transportation only.

Interested groups or individuals should write on their official stationery to The Lincoln Electric Co., 12818 Coit Road, Cleveland 1, Ohio, or to the U. S. Bureau of Mines, Experimental Station, 4800 Forbes St., Pittsburgh, Pa.



Model NH5W with 4-80,000 C.P. floodlights.

The NITE-HAWK Gives You:

LIGHT—Where you want it—when you want it.

POWER—To operate hand tools—saws, drills, hammers, etc.

Floodlight and Searchlight Units up to 14 million candlepower.

Write for Bulletin A.E.D. 5

LISTER-BLACKSTONE, Inc.

1706 So. 68th Street MILWAUKEE, WIS.

HOW A B G FINISHER MAKES SMOOTHER ROADS

Here's a way to get a well packed surface without springy spots. An asphalt mat laid down with a Barber-Greene Tamping-Leveling Finisher is smooth, *firm*.

In many cases, a 5-ton roller adds only about an eighth of an inch compaction to the material *tamped* by a Barber-Greene. What's more, depressions in the base are not reflected in the finished surface. *The mat is equally packed over every variation in the subgrade.*

Hammering the hot mix 1200 times a minute, the bevelled face of the tamping bar actually compacts the material while striking it off. And to produce a mat of uniform density, the compacted mix is pushed forward and downward simultaneously.

In addition, the creeping travel of the tamper imparts a rolling movement to the loose mix in the spreading chamber. This prevents segregation of the material. And the weight of the follow-up screed — level with the stroking depth of the tamping bar — completes compaction . . . leaves a smooth, table-top surface.

A Barber-Greene *Tamping-Leveling* Finisher will help you build better, smoother, lower-cost roads. Write for B-G Finisher Catalog. Barber-Greene Company, Aurora, Illinois.

The tamping bar on a Barber-Greene Finisher compacts the hot mix while striking it off. Material is pushed forward and downward at the same time to fill all the voids in an uneven subgrade. A mat of equal density throughout is produced.

Barber-Greene B G *Constant Flow Equipment*

45-4

New Bill Threatens Competitive Bidding

(*Continued from page* 1)

encouragement of free enterprise in all types of business activity.

Furthermore, although it is one of the purposes of the bill to save the Government money, past experience with negotiated contracts, or any other than contracts awarded as a result of free competitive bidding, has demonstrated amply that in the final analysis any such procedure can result only in higher costs to the Government and less efficient work.

Selection of Contractors

The procedure for letting contracts under this new scheme is as follows: (1) The awarding authority will submit to prospective contractors, either by special invitation or general advertisement, a questionnaire relative to their qualifications. Based on the information in these returns, together with such supplemental investigations as the ratifying committee may wish to make, the contractor who, in the opinion of the committee, is best fitted to undertake the work will be selected. At the same time the questionnaires are sent out, contractors will be furnished a statement setting forth the nature of the work, its location, starting and completion dates, and an estimate of all costs of labor, materials, and fees.

(2) After the contractor has been selected, the awarding authority will negotiate with him for the purpose of establishing a lump-sum fee for his services. Then the general contractor is required to negotiate contracts with all subcontractors on the basis of a lump sum for the work to be performed, including all elements of cost and a specified fee for the services of each subcontractor. In the event the general contractor is qualified to perform certain parts of the work himself he will be permitted to negotiate for it on a lump-sum basis just as though the work were being sublet to another contractor. All such contracts entered into by the awarding authority are subject to approval by the ratifying committee. (3) Extra work done by a subcontractor or by a general contractor must likewise be negotiated in advance on a lump-sum basis before the work can be approved.

The Contractor's Fee

The proposed measure sets up criteria for the determination of the allowable compensation to the general contractor as well as subcontractors. These fees are determined by the importance of the work, the skill required to execute the contract properly, and the time estimated to be necessary to complete the work. The fees include the cost of overhead items, such as a central office for estimating, purchasing, expediting, accounting, financing, and general supervision.

Embodying the principle of renegotiation, the bill requires that, before final payment is made, the books of the contractor, as well as all subcontractors, are to be audited by the ratifying committee to determine the true overall cost of the work and the total profit or compensation, including that made on extra work. It is specifically provided that in no event can the total compensation exceed the sum agreed to at the time of negotiation. When the job is completed and certified by the awarding authority, the ratifying committee then determines whether profits in excess of those agreed upon have been made by the contractor. If it is found that compensation in excess of the agreed amount has been paid, the contractor is required to repay any such amount to the Government. In this connection, it is significant to note that no provision is made to reimburse the contractor in the event a loss is sustained in connection with the work. As a matter of fact, other provisions of the bill specifically preclude the adjustment of losses.

Clarity of Bill

It is not entirely clear whether the bill would apply to Federal-Aid highway projects. The exact terms of the bill refer to "all construction contracts entered into by any department, bureau, or agency of the Government" but while Federal-Aid contracts involve Federal funds they are entered into by the state and not the Federal government. It would therefore seem to follow that Federal-Aid highway contracts would not be affected by the proposed law. But, if any such procedure is established for Federal contracts, it is reasonable to assume that it would soon be expanded to include all construction contracts financed in whole or part with Federal funds, regardless of who the awarding authority might be.

Opposition to Bill

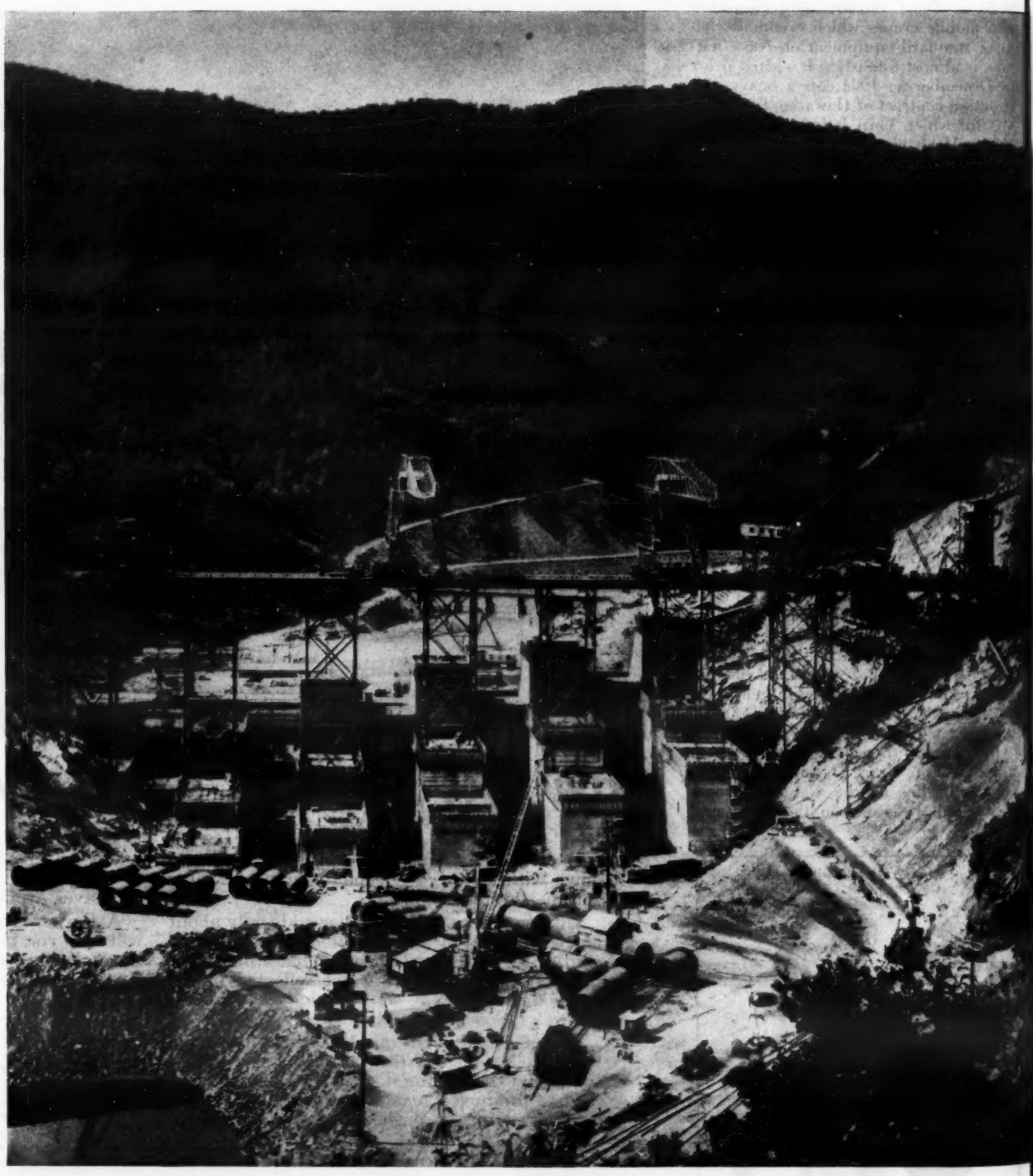
We feel that active and strenuous opposition to this bill should be instituted by all contractor and taxpayer organizations who seek government economy and the continuation of free enterprise. If this bill becomes a law, it will inevitably increase the cost of government construction because the very methods of selection and payment are unsound. The latter has already been discarded by the military services as extravagant.

As far as the contractor is concerned, the method of selection is unfair and discriminatory. Too much power is placed in the hands of the Ratifying Committee, with opportunity for prejudice, favoritism and even bribery, which are impossible under competitive bidding. There is not the compelling power of the low-bid contract to call for the exercise of full economy and ingenuity on the part of the contractor; hence efficiency in construction would lessen on government contracts.

Above all, the bill promotes a method of contract award which is a direct blow to the free-enterprise system in which the man who can and will do the job in accordance with the plans and specifications for the least money has the opportunity to receive the award of the contract after sealed bids have been received.

The American Road Builders' Association has already taken the position that this proposed legislation is impractical, unsound, and wholly unnecessary. It will not result in lowering construction costs to the Government nor will it eliminate so-called "unfair trade practices", whatever they may be. Conversely, the only possible effect of this ill advised law would be the demoralization, if not the destruction, of an industry which, if given a chance, will play a most vital part in stimulating and maintaining a prosperous post-war economy.

Plasma without paper is useless. You generously donate your blood to the Red Cross, but the life-giving plasma must travel to the fighting front in paper containers, for which waste paper is needed. Salvage yours.



$75,000,000 Planning Fund Greatly Needed

The Federal Works Agency some time ago asked the Congress for funds to assist the states and lower levels of government in plan preparation, as provided in Title V of the War Mobilization and Reconversion Act of 1944. In spite of urgent pleas by spokesmen for the FWA, the House cut the $75,000,000 recommendation to $5,000,000. Charles M. Upham, Engineer-Director, American Road Builders' Association, urged that the Committee reinstate the $75,000,000 as a minimum to assist the states and their political subdivisions in the preparation of plans for public works. This sum would provide plans for an economically sound construction program approximating $1,500,000,000. Mr. Upham stated, "Unless adequate provision is made for post-war planning, we face a return of the WPA type of program or something even worse."

Commenting on the lack of plans to date, Mr. Upham pointed out that, unless the present rate of plan preparation can be substantially stimulated, we face an alarming condition at the end of the war. Excluding Federal-Aid and state highways, public works plans in the completed stage represent a total construction program of only $1,000,000,000. Aggravating this situation, we further find that, of this total, $250,000,000 represents plans for New York City alone, while two-thirds of all completed plans are accounted for by only five states, New York, California, Illinois, Michigan, and Ohio.

Annual public works expenditures in the neighborhood of $5,000,000,000 will be required in the post-war period to supplement private construction and maintain a high national income and provide full employment. Unless plans are ready to carry on this volume of work, we may expect the substitution of makeshift programs. During the last depression, construction was the real vitalizer of prosperous conditions, and depressions are started when construction levels drop off sharply.

Mr. Upham concluded, "Efforts to revive the construction industry during the early 30's were unsuccessful because the Federal government embarked on a hastily prepared employment program which of itself brought on additional economic evils. Due to the lack of adequate plan preparation, made work was resorted to on a large scale which produced little, if anything, in the way of permanent improvements and brought about a competitive condition within the construction industry which threatened its very existence and caused further unemployment."

Post-War Roads in India

A 10-year post-war highway reconstruction program in India, to cost $1,350,000,000, has been announced. The Province of Madras, which has been allocated $180,000,000 to which the Provincial Government will add $210,000,000, has a road system of 36,676 miles of which only 16,000 miles are in good or fair condition.

Cooling Concrete

120 TIMES FASTER!

HEAT from hydration of cement in the 2,800,000 cu. yds. of concrete used in building TVA's Fontana Dam would normally take 40 years to dissipate completely. However, by circulating water—cooled by a 250-ton-per-day refrigeration plant—through pipes embedded in the concrete, the required cooling and shrinking was accomplished in two to six months, an average of 120 times faster.

Speedy completion of giant projects like Fontana is due not only to improved methods of cooling concrete, but also to improved construction machinery and improved lubricants designed to assure their maximum performance. In the development of lubricants, Texaco has played a leading role.

Texaco Alcaid, Algol or *Ursa Oils* in air compressors, to cite one example, assure wide-opening, tight-shutting valves, free piston rings, open ports, clear lines, continuous air supply. They also assure maximum service life between overhauls, fewer repairs and replacements. Their use in compressors is worldwide.

Texaco lubricants have proved so effective in service they are definitely preferred in many fields, a few of which are listed below.

Texaco Lubrication Engineering Service is available through more than 2300 Texaco distributing plants in the 48 States. Get in touch with the nearest one, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

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Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Cures for Accidents At Road Intersections

Enforcement of Traffic Regulations, Channelization and Grade Crossings All Used by State of Illinois

✦ NEARLY one-half of the reported highway accidents in Illinois occur at intersections. Failure of vehicles on less important highways and streets to stop at through routes accounts for many of these. Many such occurrences are scattered among the thousands of minor intersections in the state, no one of which ordinarily shows sufficient accident frequency to warrant corrective treatment of the intersectional layout. Improvement in this phase of the accident record, it is felt, must depend upon stricter compliance with traffic regulations.

A great number of intersection accidents, however, take place at junctions of principal highways. Here there is often opportunity for preventive measures. Frequently, a concentration of accidents at such points warrants considerable expenditure for the installation of safeguards. Where traffic volume is heavy, conflicting movements produce a high rate of accident exposure. Grade separations offer the most positive means of combating intersectional accidents. However, their tremendous cost is justified only where traffic is extremely heavy. In many cases, topography and other physical features make them impractical.

Accepting the fact that most principal highway intersections must remain at grade, it follows that they will continue to be points of high potential danger. The various movements traffic may make at even the simplest intersection produce several hazardous conflicts; as the type of intersection becomes more complex, the points of conflict increase both in number and the degree of hazard. At the conventional highway junction the entire intersectional area is paved, resulting in a broad expanse of pavement on which some vehicles may wander from natural and expected paths. Channelization of intersections tends to decrease the extent and intensity of traffic conflicts. This is accomplished by fixing the channels through which the several traffic movements should pass, the neutral areas between channels consisting of raised islands. Each channel follows the most natural course for its traffic movement, in keeping with the need for minimizing conflict with other movements. Thus all vehicles making the same maneuver follow the same path, with conflict points definitely established and hence more readily safeguarded.

The islands which separate the several traffic channels serve to guide the motorist into his proper course and to discourage his doing the wrong thing. By occupying the normally dead spaces of the intersection, the islands eliminate the confusing traffic movements which result from too spacious paved areas. They protect turning vehicles from higher-speed through traffic, and frequently also serve as refuges for pedestrians.

An Example

The sketch map on the next page shows a typical channelized intersection of the "Y" type at the junction of U. S. 40 and Illinois 159 in southern Madison County. Both of these highways carry heavy volumes of traffic, including interstate traffic headed for St. Louis, Mo. Counts made before the war showed an average of 6,000 vehicles per day passing through the intersection. Originally, the entire intersectional area was paved. Many violent collisions involving a heavy toll of fatalities, personal injuries, and property damage occurred.

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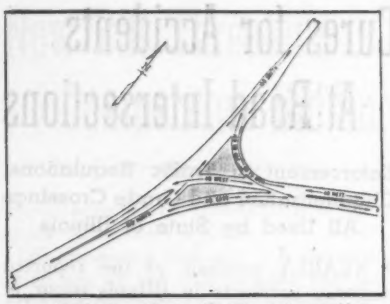

A typical channelized intersection showing the flow of traffic from one route to another.

Cure for Accidents At Road Intersections

(Continued from preceding page)

Because of its bad accident record, the intersection was channelized in 1942. The layout sketch shows the several channels provided to accommodate the various traffic movements. Because it carries more traffic, Illinois 159 was made the preferential route and its traffic is permitted to proceed through the intersection in either direction without a stop. West-bound traffic on U. S. 40 is required to stop before crossing the lanes of Illinois 159. East-bound U. S. 40 traffic does not conflict with traffic on Illinois 159, and therefore is not required to stop.

Channelization of the intersection has resulted in marked improvement in the accident record. No fatalities have occurred since the change was made, and personal injury accidents have been few. Accidents involving property damage only are not required to be reported and hence no record of them is available. However, it appears from observation, according to the *Highway Bulletin* of the Illinois Division of Highways, that they are continuing but at a gradually diminishing rate. This indicates that some drivers are entering the intersection at too high speed and are running into the islands, or are entering the wrong traffic channels, but that as more drivers become familiar with the intersection these difficulties are decreasing.

Experience here indicates that no difficulty in negotiating a channelized intersection should be experienced by the driver who follows these three practices:

1. Approach the intersection at a speed compatible with conditions.
2. Follow the channel which the direction signs indicate is proper for the traffic movement intended.
3. Comply with stop signs and other warnings.

Construction Labor In Post-War China

Post-war reconstruction and economic development of China's resources face an inadequate labor supply at high wages and the need for a large engineering personnel, according to Lee Fah Yih, assistant to the executive director of the China Institute in America, in an address at the annual meeting of the American Society of Mechanical Engineers in New York.

Noting that in the past China has been prominent as a field of low labor costs because of low living costs, small productivity of labor, and scant labor demand, the speaker said that in the post-war era the demand is likely to be more acute than in the United States today. In addition, the cost of living averages higher in China now than anywhere else in the world.

"These facts mean that the Chinese labor will be expensive compared with other costs in any engineering projects," continued Mr. Lee. "The famous cheap labor condition will not exist in post-war China. It is understandable that China will not have enough financial ability to carry out its reconstruction program easily, so that economy in the reconstruction work will be absolutely necessary. Since the cost of labor will be the most significant figure in any engineering projects during the post-war reconstruction program, the money saving we can possibly expect will be from the efficient use of the laborers. This will mean the application of scientific management."

The speaker said there is now a labor supply in China of about 5,000,000, and placed the post-war figure at 7,000,000 workers. He cited an official estimate that 180,000 engineers will be needed, including 5,000 in the field of industrial management. Such needs, he indicated, can be met only by including some management personnel from other countries.

Pointing to the size of China's post-war tasks, Mr. Lee said that in addition to the industrial installations on a scale much greater than pre-war and the development of petroleum and mineral resources, there is need to build 50,000 miles of railroads and 100,000 miles of highways to connect production centers.

Lee Fah Yih envisages China's post-war job thus:

"In the ten years immediately following the end of this war, we will have the following main tasks to perform: to rehabilitate the Chinese industry and to establish new industries; to develop the natural resources in China, which have been discovered but cannot be developed due to the lack of equipment and machinery; to extend the transportation system, to provide adequate transportation for the distribution of China's products; to rebuild the ruins of the war; to establish the public utility system throughout China, which will include the water supply, electricity, etc.

"To carry out the first task, the laborers available for the post-war work will already be insufficient. The new industries to be established in the next ten years will surpass the industries we had before the war.

"The management role for China's reconstruction will not only mean a task for the Chinese, but also for the engineers from other countries. Whether the foreign management personnel will be welcomed or not in China will be up to foreigners themselves. As you all know, you cannot succeed in handling laborers if you do not understand them, and understand the complete local situation. Being engineers, our duty is to contribute as much as we can to this world. Since the engineering performance has been so much in advance in this country, and way behind in China, you will find a better opportunity to make contributions to this world there. If you should wish to have a big salary, comfortable living, a better future in making money and holding a position, you should stay in this country. On the other hand, if you would like to perform a task, to have a better opportunity in carrying out your new ideas, to lead a large group of workers, and in return to receive a respected position and satisfactory remuneration, China will be your better bet. You will be more proud to see a factory which is laid out according to your design of plan, rather than to see some improvement made by you to an old plant. We all like to see the fruit of our work, and in China we will have the opportunity."

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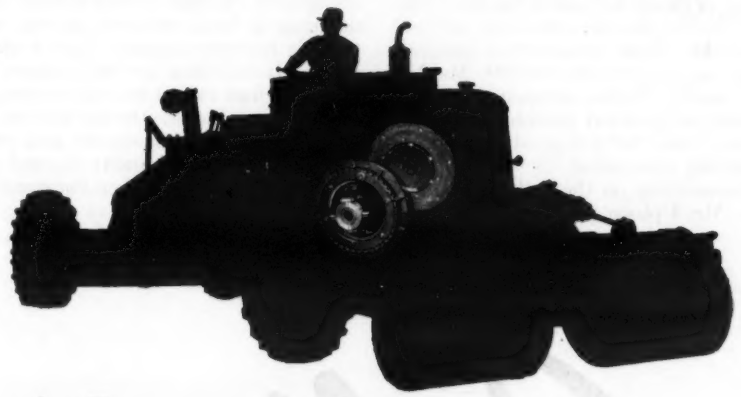
CLUTCH Building EXPERIENCE
Your Engineers Can Use *Now*



Because of the wide variety of experience and clutch building facilities at their command, our engineers are solving the most difficult power transmission control problems. They can help *you* avoid LOST reconversion TIME on either standard or out-of-the-ordinary clutch applications. Arrange *now* to benefit from their clutch recommendations for *your* post-war designs. They'll be glad to plan with you.

SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning postwar products.

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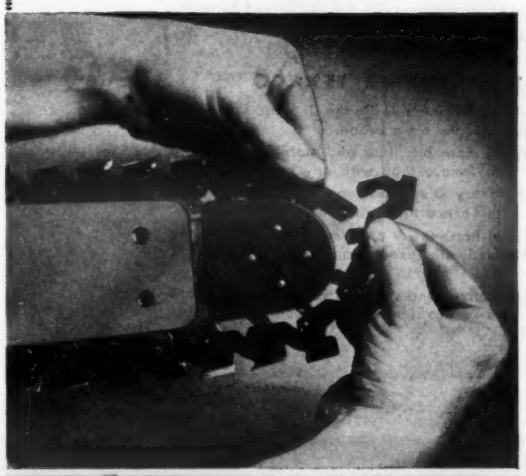
SPRING LOADED OVER CENTER · ONE-WAY · SPRING LOADED · POWER TAKE-OFF · PULLMORE MULTIPLE-DISC · OVER CENTER

THE LOMBARD POWER CHAIN SAW
is a "quick-chainge" wonder!



NOW . . . Chain saw links replaced in 6 minutes! Simply hook out the old, hook in the new . . . and you're set to go!

If you've used power chain saws you know the difficulty you've had in changing damaged links with certain types of chains. Usually it is a good hour's job in the shop, and about double that time out in the field — if you happen to have all the necessary tools handy.

With the new Lombard "quick-chainge" wonder chain, it's all done in about six minutes. Remove the helper's end, release chain tensioner, unhook the damaged link, hook in a new one, set chain tension adjuster — put on helper's end. It's simple, it's quick, it's modern.

Available in 24" air model, weighing only 42 pounds, operating from standard 105 cubic foot compressor. Ideal for underwater cutting. Will cut standing timber within two inches of ground.

Also available in 3 HP, 60 cycle, 220 volt, 24" and 36" cutting blades. Write for literature.

Dealer Opportunities in Some Areas

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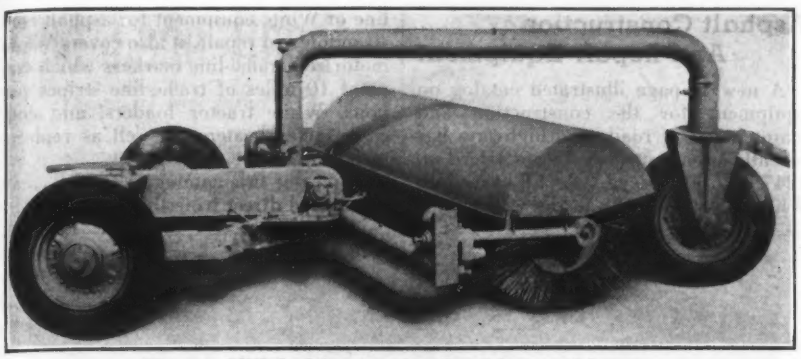


The new Littleford two-way traction-driven road broom.

Two-Way Road Broom In Two New Models

The newest Littleford road broom is made in two models, the 106 and the 108. Both are two-way units which can be changed from one sweeping position to another in two-seconds time. Other features include the Littleford hydraulic lifting arrangement, and the mono-frame. Both can be turned in a small radius, due to their three-wheel construction. A sprinkling system can be added to either model, and a blower attachment to the power-driven broom.

The Model 106, shown in the illustration, is the traction-driven type, all power being produced from the rear wheels. Model 108 is similar in general style except that it is powered by an engine mounted at the rear.

Further details on either or both of these new road brooms may be secured by interested contractors and state and county highway engineers direct from Littleford Bros., 485 E. Pearl St., Cincinnati 2, Ohio.

Do You Know Where The Spare Parts Go?

Equipment for the maintenance of highways and for construction throughout the country has been greatly slowed up by the lack of adequate stocks of spare parts. Most equipment men have lamented that more spare parts could not be manufactured to take care of this essential civilian need. From Allied Force Headquarters in Italy comes a report which explains a whole lot about spare parts. According to this story about spare parts, "In civilian life it would be just another $10,000,000 business, but to the Army the 754th Engineer Spare Parts Company is worth many times that."

In its two years overseas, this company has supplied more than 1,000,000 vitally needed spare parts to Engineer units for every invasion in the Mediterranean Theater of Operations. The company has in stock 80,000 engineer items, ranging from ½-ounce cap screws to Caterpillar D8 tracks weighing 1½ tons.

One of the most amazing facts about this company is its safety record. During its years overseas it has not suffered a single serious casualty. "The most serious injuries," reports the commanding officer, Captain Charles S. Lockwood, Jr., of Kansas City, Mo., "were a couple of smashed thumbs. That is our record despite the fact that we have been in bombing raids and handled all kinds of heavy equipment under all kinds of conditions."

If it is a spare part for engineering purposes, the 754th has it, or builds it without sending to the States for it. Always on hand are such items as parts for well-drilling equipment, parts for power shovels, water pumps, generators, and cranes. In its stock bins also are outboard motors for small boats used in the construction of pontoon bridges. The company has parts for 250 different machines but does not stock a single complete machine. It has, for example, some 240 types of fan belts.

This outfit was staffed more than two years ago in the United States by men who worked in the spare-parts departments of such plants as International Harvester, Caterpillar, Firestone Tire, and many other heavy-industry factories. The men were given special Army Engineers equipment training at Columbus, Ohio, and the company was sent to Oran, North Africa, in February, 1943.

What the 754th needs and can't get, it builds. The men point with pride to their present home, a bombed-out industrial plant which they re-walled and re-roofed in a couple of months.

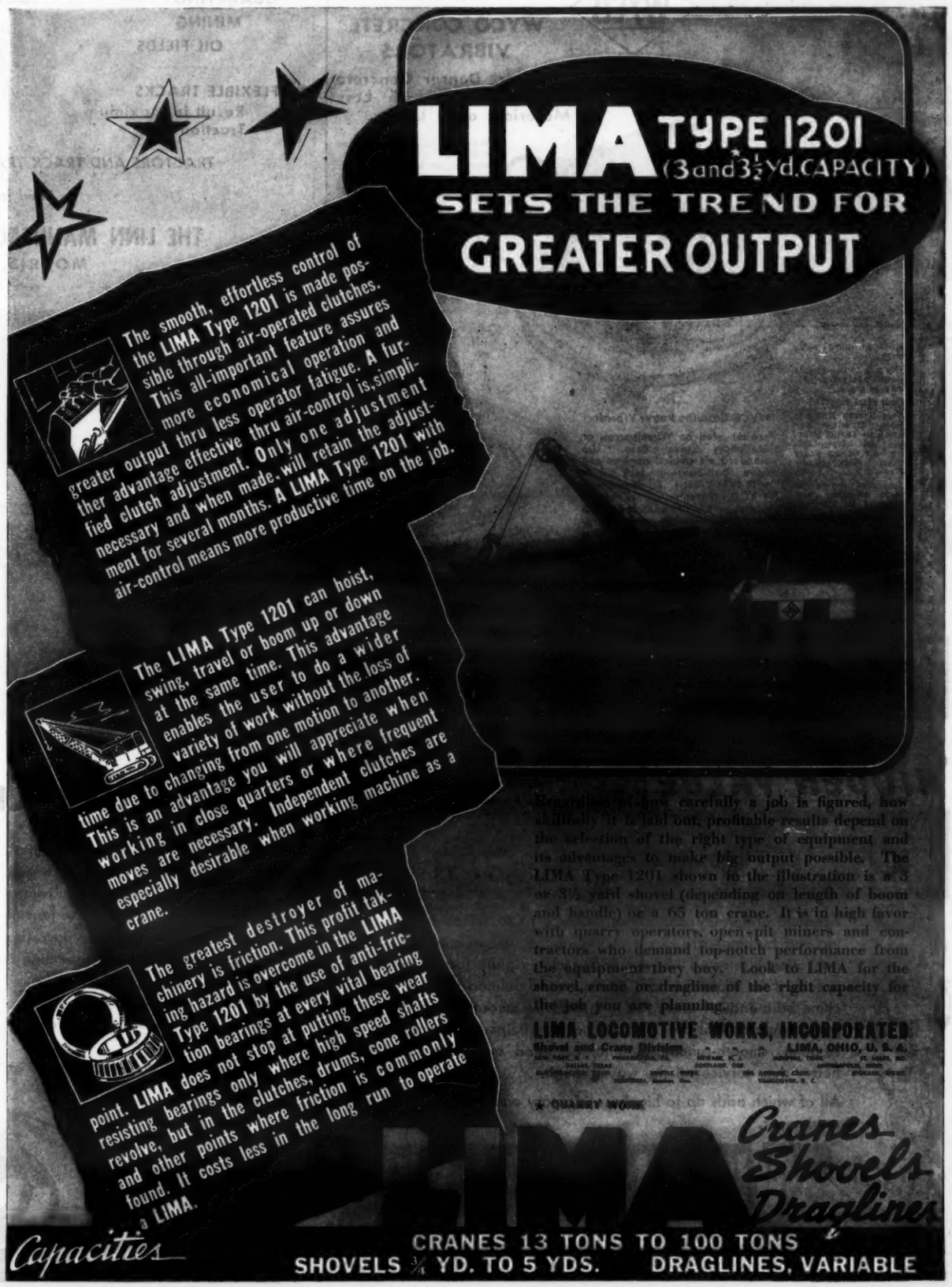
Although it is not exactly part of its job, the company furnishes maintenance instructions with every spare part it issues. Each time it sends out engine valves, for example, it sends along the suggestion that the users cut the high-octane gasoline with kerosene, thus reducing the heat and preventing the valves from burning out rapidly. The men say this extra work is their contribution to the home-front's conservation-of-material program. They believe that their duty is not only to furnish American equipment efficiently but to help preserve it. More power to them!

Most of the outfit's daily business is to supply the Fifth Army, but occasionally the Navy calls for spare parts. During the invasion of Sicily, the company received a letter of commendation from the Seventh Army for its speedy work in filling requisitions for tons of equipment for the invading forces. Another merit badge was received back in Africa when the outfit won a trophy for efficiency in a base section contest. The award is the overseas military equivalent of the prized "E" pennant given civilian war plants in the States.

Cliff Gould Is Back With Barber-Greene

Lt. Col. C. B. Gould, for many years Manager of the Detroit office of Barber-Greene Co., Aurora, Ill., manufacturer of asphalt paving machines and material-handling equipment, has recently been released from the Army Air Corps, and has again assumed his duties with Barber-Greene in his previous capacity, with headquarters at 25 E. Seven Mile Road, Detroit, Mich.

"Cliff" Gould returns to Barber-Greene after several busy and very interesting years, including his first assignment at Morrison Field, West Palm Beach, Fla., where he was Engineer Officer of the 15th Group. Since the autumn of 1943, he has been with the Army Air Transport Command, Homestead, Fla., which has the responsibility of getting out combat and cargo planes to the theaters of operation. While there, Gould was Commanding Officer of the 54th Squadron.


LIMA TYPE 1201
(3 and 3½ yd. CAPACITY)
SETS THE TREND FOR
GREATER OUTPUT
The smooth, effortless control of the LIMA Type 1201 is made possible through air-operated clutches. This all-important feature assures greater output thru less operator fatigue. A further advantage effective thru air-control is, simplified clutch adjustment. Only one adjustment necessary and when made, will retain the adjustment for several months. A LIMA Type 1201 with air-control means more productive time on the job.
The LIMA Type 1201 can hoist, swing, travel or boom up or down at the same time. This advantage enables the user to do a wider variety of work without the loss of time due to changing from one motion to another. This is an advantage you will appreciate when working in close quarters or where frequent moves are necessary. Independent clutches are especially desirable when working machine as a crane.
The greatest destroyer of machinery is friction. This profit taking hazard is overcome in the LIMA Type 1201 by the use of anti-friction bearings at every vital bearing point. LIMA does not stop at putting these wear resisting bearings only where high speed shafts revolve, but in the clutches, drums, cone rollers and other points where friction is commonly found. It costs less in the long run to operate a LIMA.
Regardless of how carefully a job is figured, how skillfully it is laid out, profitable results depend on the selection of the right type of equipment and its advantages to make big output possible. The LIMA Type 1201 shown in the illustration is a 3 or 3½ yard shovel (depending on length of boom and handle) or a 65 ton crane. It is in high favor with quarry operators, open-pit miners and contractors who demand top-notch performance from the equipment they buy. Look to LIMA for the shovel, crane or dragline of the right capacity for the job you are planning.
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CRANES 13 TONS TO 100 TONS
SHOVELS ¾ YD. TO 5 YDS. DRAGLINES, VARIABLE

Jeep-Mounted Welders Serve in Battle Areas

Modified G-E arc welders mounted on standard ¼-ton Army jeeps are being used extensively by maintenance organizations dispatching contact parties in the combat areas, according to a recent report from the General Electric Co., Schenectady, N. Y. Because of their compactness and light weight, as well as their maneuverability over difficult terrain, these mobile units have also been adopted for jungle use and are expected to be used for airborne and amphibious operations.

Driven by a V-belt on a power take-off from the jeep's engine, the welders are bolted to the floor of the jeep in place of the right-hand front seat. They provide 40 to 250 amperes of current, and are capable of handling electrodes of various sizes up to and including those ¼ inch in diameter. The welders are ready for use as soon as the jeep is stopped. A governor, which is disengaged by a hand-operated clutch for normal operation of the vehicle, maintains the engine speed during the welding operation, while belt guards and heavy protective covers safeguard the personnel.

When not in use, the welder does not interfere with the customary use of the jeep, since the closed cover serves as a seat.

Griffin Branch Office In Jacksonville Moves

The Griffin Engineering Corp., southern branch of the Griffin Wellpoint Corp., New York City, has recently moved to a new location at 2016 East Adams St., Jacksonville 2, Fla. Neill N. Payne is Manager.

Among the services which are rendered at this branch are the rental and sale of Griffin wellpoint systems, centrifugal pumps 1½ to 10 inches in size, and Griffin portable engine-driven generators and flood-lighting equipment.

Asphalt Construction And Repair Equipment

A new 16-page illustrated catalog on equipment for the construction and maintenance of roads and highways has recently been issued by White Mfg. Co., 1247 W. Beardsley Ave., Elkhart, Ind. While devoted chiefly to the well known line of White equipment for asphalt construction and repair, it also covers White motorized traffic-line markers which can paint 10 miles of traffic-line stripes per hour, White tractor loaders, and concrete mixer heaters, as well as replacement oil burners.

Copies of this catalog, No. 32-B, may be secured direct from the company.

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Cut Placement Costs 50% with WYCO CONCRETE VIBRATORS

Get Stronger, Denser Concrete Rapidly and Easily with Less Material and Labor

WYCO Flexible Shaft Drive Vibrators eliminate honeycombing, air bubbles and scaly surfaces. Stronger, denser, high quality concrete is obtained with large savings in material and labor. WYCO machines have a national reputation for high efficiency and low maintenance cost. Both Electric and Gasoline Power driven units are available as illustrated, with interchangeable tools for Grinding, Drilling, Surfacing, Wire Brushing, Sawing, etc.

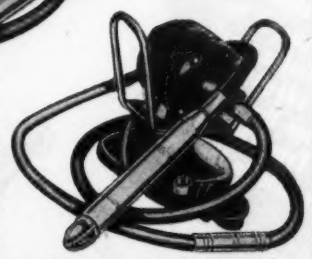
Write for Catalog

1 Nose of hard alloy steel.
2 Head completely sealed against grease, dirt or water.
3 Cast steel rotor.
4 Two Norma Hoffman Roller Bearings and one Ball Thrust Bearing for dependable rotor action under most severe conditions.
5 Improved design for more effective rotor impulse to vibrator.
6 Protected oil plug for change of oil when needed.

Every WYCO Flexible Shaft has the WYCO Patented Non Metallic INNERLINER Makes the Core Last Longer — Run Smoother — Transmit More Power.

WYCO Gasoline Power Vibrators are mounted on Wheelbarrow or Stationary Swivel Base. Use standard air cooled engines and have ball-bearing jack shaft with twin V-belts. Equipped with WYCO Patented Jack Shaft Clutch—manually operated—completely disengages engine, prolonging life of shaft core—makes starting quick and easy.

Also—3 Types of WYCO Electric Drive Vibrators



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RODS
Another
"HIDDEN VALUE"
IN ALL
WISCONSIN *Air-Cooled* ENGINES

Absolute uniformity and close-tolerance fit of all connecting rod bushings are direct results of the unique machine operation illustrated above. Each rod is rigidly locked in precisely the same position, and diamond-pointed bits machine both ends of every rod with uncanny smoothness and perfect mechanical precision. All of this helps to produce a quiet, smooth-running engine, designed and built for heavy-duty service all the way through.

All of which adds up to highly satisfactory *end use* on your equipment.

Most H.P. per pound

WISCONSIN MOTOR
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MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

Effective Crowd Control

Regardless of the material being handled, Insley Excavators save time on the job. Crowding speed is under perfect control at all times . . . fast or slow to provide whatever crowding pressure operating conditions require. Faster retraction is obtained by the reversible, two-speed front drum. Boom can be raised or lowered without adjusting the crowding drive.

This is but one detail of Insley design and construction that contributes to reduced dirt or rock moving costs . . . but one of many reasons why it will pay you to consider Insley Excavators for new equipment needs when production for civilian use can be resumed. Write now for specifications on the Insley Excavator . . . ⅜ and ½-yd. sizes . . . six easily interchangeable attachments, shovel, trench hoe, basement hoe, dragline, clamshell and crane.

INSLEY MANUFACTURING CORP., INDIANAPOLIS 6, IND.

The Ledo Road

(*Continued from page 2*)

Road was kept under constant construction for eventual use by convoys going forward.

Progress and Rainfall

From October 13, 1943, to January, 1945, the road was completed from the 45-mile mark to the junction of the Burma Road, a distance of 420 miles, and the first 45 miles were straightened, widened, and the surfacing improved. This represents progress of about a mile of road completed per day over a route that passes through 102 miles of mountain section containing two approximately 4,000-foot passes.

During seven months, from March through October, 1944, of the fifteen-month construction period, 175 inches of rain fell in the mountains and 100 inches of rain was recorded in the valley. By way of comparison, the eastern coast of the United States has an average of less than 45 inches of rain annually.

While the construction of roads was the designated mission of the troops who have completed this vital link, this is, by no means, an indication of the total accomplishments in the field of construction during this fifteen-month period. Airfields having a combined seal-coat-surfaced runway area of about 340,000 square yards or approximately 70 acres were constructed. In addition to the main runways, it was necessary to construct, at each of the airfields, thousands of feet of taxiways leading to surfaced aprons, revetments, and dispersed parking areas, which more than doubled the area surfaced for the runways proper. Numerous liaison strips were also built along the route to support combat and supply operations.

In support of the construction troops and the combat forces, it was necessary to provide housing facilities for thousands of men, hospitals for the sick and wounded, and several million square feet of covered warehouse space.

Earth Moving and Drainage

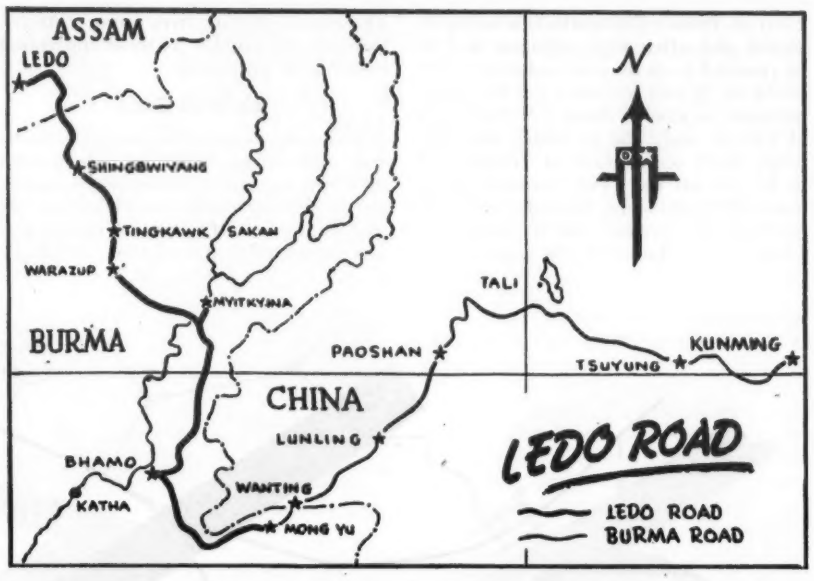
Almost unbelievable quantities of earth had to be moved in order to push the Ledo Road through the 270 miles of virgin jungle to the junction with the Bhamo Road. To handle drainage, trainload after trainload of culvert pipe had to be moved into Ledo and then down the road to the points of use.

Through the 102 miles of mountain section, where the minimum shoulder-to-shoulder width of the road is 33 feet, 100,000 cubic yards of dirt were moved for each mile of road constructed. In the valley, where 49 feet is the minimum shoulder-to-shoulder width, 25,000 cubic yards were moved per mile. In round figures, an average of 50,000 cubic yards of earth was moved for each completed mile through the jungle, or a total of roughly 13,500,000 cubic yards. With this amount of dirt, it would be possible to build a solid dirt wall 3 feet wide and 10 feet high in a straight line from New York City to San Francisco.

If the culvert pipe used in the drainage system of the Ledo Road were placed end to end, it would form a continuous pipe 105 miles long which is about one-quarter of the entire length of the road. It is estimated that an average of 1,200 feet of culvert was installed for each mile of the road.

Road Surfacing

The earth over which the Ledo Road passes is a sandy loam that whips into liquid mud and which requires a heavy surfacing to withstand the pounding of convoys. Such rock as is available in the mountain sections has shale-like properties and soon grinds into a powder if used for a surfacing material. Therefore, gravel deposits from the rivers along the route furnished the only source of road surfacing. Recovering gravel from the stream, along with the haul and spreading, constituted a major accomplishment in itself. It was sometimes necessary to transport gravel as much as 25 to 30 miles.



In the 102 miles of mountain terrain, gravel was placed 12 inches deep over a 20-foot section, amounting to about 3,865 cubic yards of gravel per mile for the initial coverage. About 1,920 cubic yards more gravel was required for each mile to take care of settlement, shrinkage, wash, and initial patching. This gives a total of 5,785 cubic yards per mile.

On the 265 miles of virgin road through the valley, from Shingbwiyang to Bhamo, and on the 98 miles of road from that point to the junction with the Burma Road, 8 inches of gravel was spread over a 20-foot section, or about 2,580 cubic yards to the mile. The initial maintenance here required an additional 860 cubic yards of gravel per mile or a grand total of 3,440 cubic yards placed on each mile of road.

It would take at least 1,100 fifty-car trainloads, or a string of railroad cars 470 miles long, to move the 1,383,000

(*Concluded on next page*)

AS MUCH AS
40,000
SQUARE YARDS
2" SURFACING

WOOD ROADMIXER Combines *Quantity* and *Quality* With Low Cost!

40,000 square yards per day *is* unusual production for a Wood Roadmixer, but it can be done. Of prime importance, however, is the fact that such production is achieved with minimum equipment and man power.

The Wood Roadmixer is a *complete* traveling mixing plant. A working unit consists of three pieces of equipment, the Wood Roadmixer, a crawler tractor which pulls and powers the Roadmixer, and a binder supply truck. Two men can handle the average job. Traveling at a regulated speed with synchronized mixing, the Wood Roadmixer produces in *one pass* a predetermined mix ready in minutes for spreading.

Using native or local materials and handling road oil, emulsion or soil-cement mixes, the Wood Roadmixer provides obvious savings in equipment, materials and labor. The long life and low maintenance record of Wood Roadmixer paving is conclusive proof of its high quality.

Wood Roadmixers are made in two sizes, handling up to 8 cu. ft. windrows. Sold by leading equipment dealers throughout the United States. For literature and costs, see your nearest dealer or write direct.

WOOD MANUFACTURING CO.
816 WEST FIFTH ST. LOS ANGELES 13, CALIF.

The Ledo Road

(*Continued from preceding page*)

cubic yards of gravel placed on the road.

River Crossings

The rivers which cross the Ledo Road, due to their number, width, and the volume of water and drift they carry in the monsoon season, presented seemingly insurmountable barriers to the completion of the project. Ten major rivers had to be crossed between Ledo and the junction with the Burma Road. From Ledo forward, these are the Tirap, Namyang, Namyung, Tarung, Tawang, Tanai, Mogaung, Irrawaddy, Taping, and the Shweli.

Not considering the numerous small creeks to be crossed, in addition to the major rivers, approximately 155 secondary streams had to be bridged before truck traffic could reach the Burma Road. In other words, there is a bridge crossing either a major or a secondary river for about each 3 miles of road constructed.

While temporary bridges and pontoon bridges had to be built to meet the demands of the tactical situation, these have all been replaced by permanent, two-way, pile-supported structures capable of carrying the maximum contemplated loads. There are in all about 165 main bridges on the Ledo Road, exclusive of the crossings over minor creeks. The total overall length of these bridges is about 5 miles.

At the Irrawaddy River, one of the longest pontoon bridges on record was placed to supply the forward operations until the permanent bridge could be constructed. The permanent bridge had to be a specially designed floating bridge, as the Irrawaddy is 60 feet deep at the crossing and fluctuates 45 feet between high and low river stages.

Lumber and Logging

Lumbering and logging operations followed the road as it was pushed south to meet the Burma Road. Demands for forest products in the form of piling, bridge timbers, planking, and lumber for the construction of sub-depots along the route reached proportions almost beyond imagination.

When monsoon rains required the building of a 2-mile causeway, over 2,400 piles and 1,000,000 board feet of lumber were cut, sawed, delivered, and put into place within a thirty-day period. It is estimated that over 822,000 cubic feet of lumber has been taken from the jungle with the limited logging facilities available for the construction of the Ledo Road.

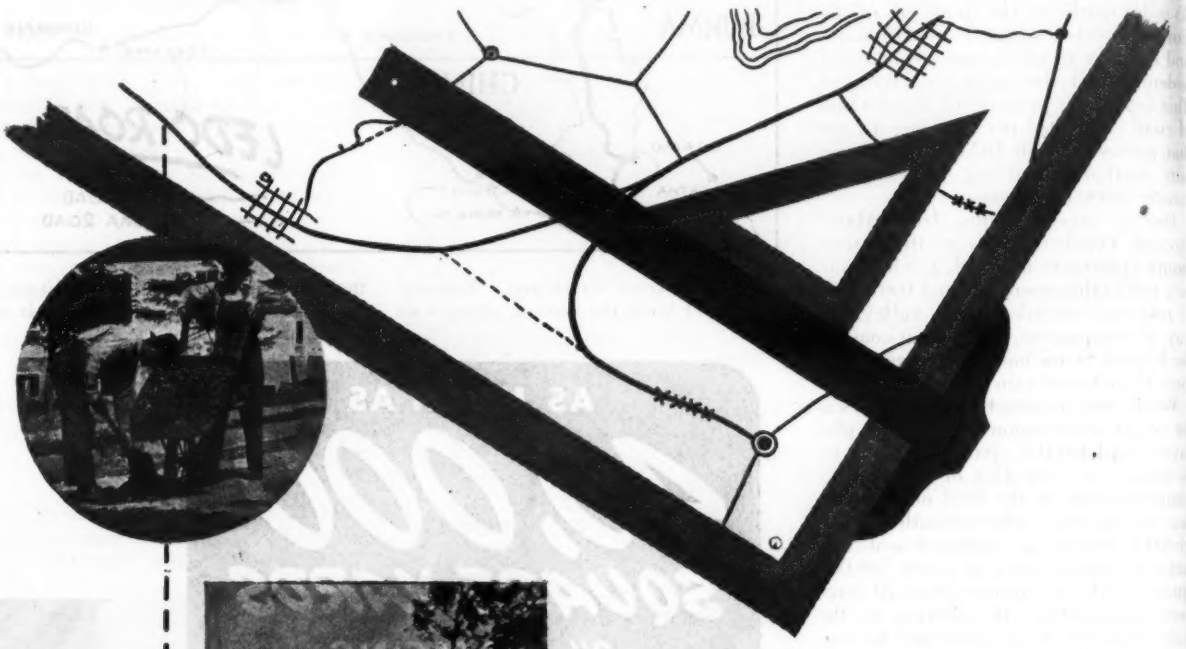
Problem of Native Labor

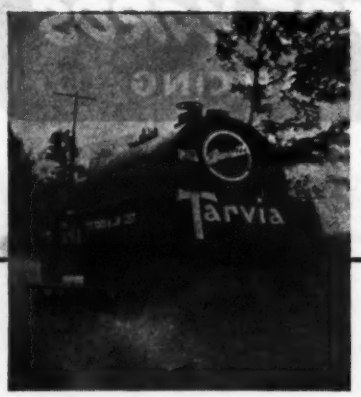
Thousands of natives were employed in the construction of the Ledo Road, the building of bases and sub-depots, handling supplies, and in anti-malaria work. Amazing problems arose in handling this labor, as the individuals comprising the force came from every religion and caste from all over India. The force included Nepalese, Travancoreans, Garos, Bengalese, and Assamese as well as troops from the Indian Pioneer Corps.

The troubles brought about by language differences alone were staggering. Each of India's 200 dialects was represented and often sign language had to be resorted to as the only solution to the problem. It was necessary for the Quartermaster to stock a dozen different types of rations and, due to castes and customs, strict segregation of groups had to be carried out. For example, there were self feeders who refused to eat food prepared by another lest he become a brother and claim all his possessions. Thousands of tiny fires were scattered through the jungles as these individual meals were prepared.

Job Well Done

However, despite the many problems and difficulties, American engineering skill and stamina and the loyal cooperation of the many native workers won out and another wartime construction job was completed in record time. On January 25, 1945, the first truck convoy left Ledo in India for the long journey to Kunming, China, over the Ledo and Burma Roads, which have been renamed the Stilwell Road by Generalissimo Chiang Kai-shek, in honor of General Joseph W. Stilwell. Once again, after three years of "blood and sweat", a land route is open to China and the Allies push forward to "set" the rising sun of Japan.





Spring Maintenance and Postwar Planning go hand in hand

Each spring presents road officials and highway engineers with a new set of maintenance problems. This year the requirements are particularly acute, (1) because wartime traffic has put an extra heavy burden on America's roads, (2) because for the third straight year regular maintenance programs have been curtailed by manpower and other shortages, and (3) because in most sections of the country the winter has been exceptionally severe. Meeting the situation is today's No. 1 road job, but meanwhile planning for post-war highway development is becoming increasingly important.

Why not talk over your problems with the Tarvia field man? He can show you how you can use Tarvia and Tarvia methods to coordinate your future construction plans with immediate maintenance needs—how you can quickly and economically strengthen and repair the existing roads that will be a part of your all-over building program.

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The Rud-o-Matic Tagline is operated on a spring principle and maintains at all times a positive tension sufficient to steady a clam shell bucket under any and all conditions, and will operate perfectly with the boom at any angle. It eliminates all the grief usually encountered with the average tagline as there are no weights, tracks, pins, carriages, or sheaves to wear out or to get out of order. Because of the large bearings and fewer sheaves, the saving on cable alone would eventually pay for it.

Tagline is complete with fair lead and cable attached and can be installed in less than one-half hour. Most of the crane manufacturers have adopted the Rud-o-Matic as standard equipment.

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LUMBER AND TIMBER
Available now
in large quantities from 1x2" to 16x16" including stress grades Fir, Hemlock, and Southern Pine. Deliveries at once by trucks or R.R. Cars.
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FEATHER the nests of our multiplying warbirds—or there will be no nests left to any of us. Buy Bonds. CONSERVE, stimulate, protect—all in one—buying Bonds.

A novel bridge-painting outfit used by Hinds County, Miss., consists of a Traxcavator on a Caterpillar D4 tractor.

Tractor and Loader Aid Bridge Painting

A novel use of a front-end loader on a tractor has been noted in Hinds County, Miss., where a Trackson Traxcavator mounted on a Caterpillar D4 tractor is used as a portable platform for painting bridges. While the compressed-air apparatus can be in a separate truck, as shown in the illustration, Hinds County engineers intend in the future to mount the compressed-air apparatus on the front of the tractor to make the combination a self-contained portable bridge-painting unit.

The tractor, which has operated 12,123 hours to date, uses less than one gallon of 9-cent fuel per hour. A small bridge can be painted in two hours. The same unit is used also for loading gravel into trucks, excavating for pipe, laying pipe, pulling a drag bucket, and similar jobs.

Present and Future Alabama Road Work

Under the recent Federal-Aid highway bill, Alabama will receive in three years $14,135,000 for primary highways, $11,196,000 for secondary roads, and $3,909,000 for highways in urban areas. When the Federal allocations are matched by the State as well as the counties and cities, the total will be $55,561,000 for Alabama's post-war highway program. The matching funds will require $20,787,000 from the State Highway Department, $3,778,000 from the counties, and $1,758,000 from the cities.

Among the major projects now being studied for post-war construction in Alabama are the Red Mountain Tunnel, Birmingham, in the north of the state, an L & N RR underpass in the Jefferson County area, and at the southern end of the state the straightening of U. S. 90 from Mobile to the west, the construction of an outer belt line from Alabama 45 at Bayou Sarah to connect with U. S. 90, the construction of an inner belt line connecting Pritchard, Crichton, and points south of Mobile, the completion of the scenic route along the eastern shore of Mobile Bay via Foley to Pensacola, the creation of a short route to Montgomery via Monroeville by the erection of a bridge across the Mobile River near Mount Vernon, or, as an alternative, the straightening of Alabama 31.

The current program of the Alabama State Highway Department has been carried on despite the absence of 600 trained men in uniform. In 1944 the State spent $3,447,499.76 for construction, but because of increasing damage to highways due to war haulage, the maintenance bill in 1944 totaled $4,021,000, the largest maintenance expenditure in the history of the State Highway Department.

The budget for 1945 calls for $3,500,000 for maintenance and $3,382,000 for highway construction which includes the $1,000,000 Tuscaloosa-Birmingham highway, work on which has already been started.

Kaiser Engineers Offer New Engineering Service

Engineers long associated with Henry J. Kaiser, and responsible for the design and construction of some of the world's outstanding projects, have been organized as a permanent group, known as Kaiser Engineers, with headquarters in the Kaiser Bldg., Oakland, Calif., in order to make available to others the engineering talent and combined experience of this group of men.

Of the more than 200 members of the staff of Kaiser Engineers, many were employed on such projects as Boulder, Grand Coulee, and Bonneville Dams; the Delaware Aqueduct; the Kaiser steel plant at Fontana; the world's largest cement plant; the record-breaking Kaiser shipyards; and members of the organization also conceived, designed, and built the 9½-mile conveyor belt which transported the gravel for Shasta Dam.

Henry J. Kaiser is President of the new organization; E. E. Trefethen, Jr., is Vice President; T. M. Price, Vice President; and George Havas, Vice President and General Manager. George W. Vreeland will serve as Chief Consulting Engineer. It is the announced policy of the company to undertake engineering work in any part of the world, and the organization includes qualified engineers in all the major fields of engineering.

New Subgrader Bulletin

The Standard-Lewis subgrader, credited by the manufacturer with the ability to complete finished subgrade from side to side forms without hand work or follow-work, is described and illustrated in an 8-page bulletin just received. This subgrader is reported to have made a production record of 8 cubic yards a minute and 12,000 linear feet of finished 25-foot subgrade in 8 hours.

Copies of this descriptive bulletin No. 52 may be obtained by writing direct to the Standard Steel Corp., 5001 So. Boyle Ave., Los Angeles 11, Calif., and mentioning this review.

F. D. Cline Construction Company, Raleigh, North Carolina, recently completed widening of this access road to a U. S. Marine Corps Air Station and a U. S. Navy Base in eastern North Carolina. Work involved grading of more than 150,000 yds. of earth and the use of more than 70,000 yds. of concrete for paving. Gulf quality lubricants and fuels helped the contractor get top performance from equipment.

GULF QUALITY PRODUCTS

and fine service help contractor make

fast time on North Carolina road job

GULF QUALITY PRODUCTS and fine service are a big help on a rush job like this," says Superintendent E. Claude Willard of F. D. Cline Construction Company, Raleigh, North Carolina. "They contribute to fewer delays in the operation and maintenance of equipment, and help insure top performance from every unit."

This access road project is one of many rush jobs where Gulf products and prompt delivery service work effectively to insure fast progress for the contractor.

Here's why so many leading contractors specify Gulf products: They have found that Gulf lubricants provide a higher degree of protection to equipment when it's pushed to the limit—and fuels of uniform quality that contribute to maximum power and efficiency. Result: fewer delays, lower maintenance costs, and better all-round job efficiency.

Call in a Gulf Service Engineer before you go to work on your next contract—let him show you how Gulf quality lubricants and fuels can help you do a speedier, more profitable job. Write, wire, or phone your nearest Gulf office today.

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Model of Freeway Aid to Engineers

Ohio Dept. of Highways Engineers Use Model of Project to Present Plan To Public; Aids in Design

By N. M. WILKE, Engineer of Design, Cleveland Planning Office, Ohio Department of Highways

✦ THE use of a scale model to answer many inquiries of the public concerning the proposed Newburgh Freeway in Cleveland, Ohio, not only makes it possible for the layman to get a clear picture of the project and the section of the city affected by its construction, but also has proved to be exceedingly helpful to the engineers of the Ohio Department of Highways and of the Regional Association of Cleveland in planning many construction details.

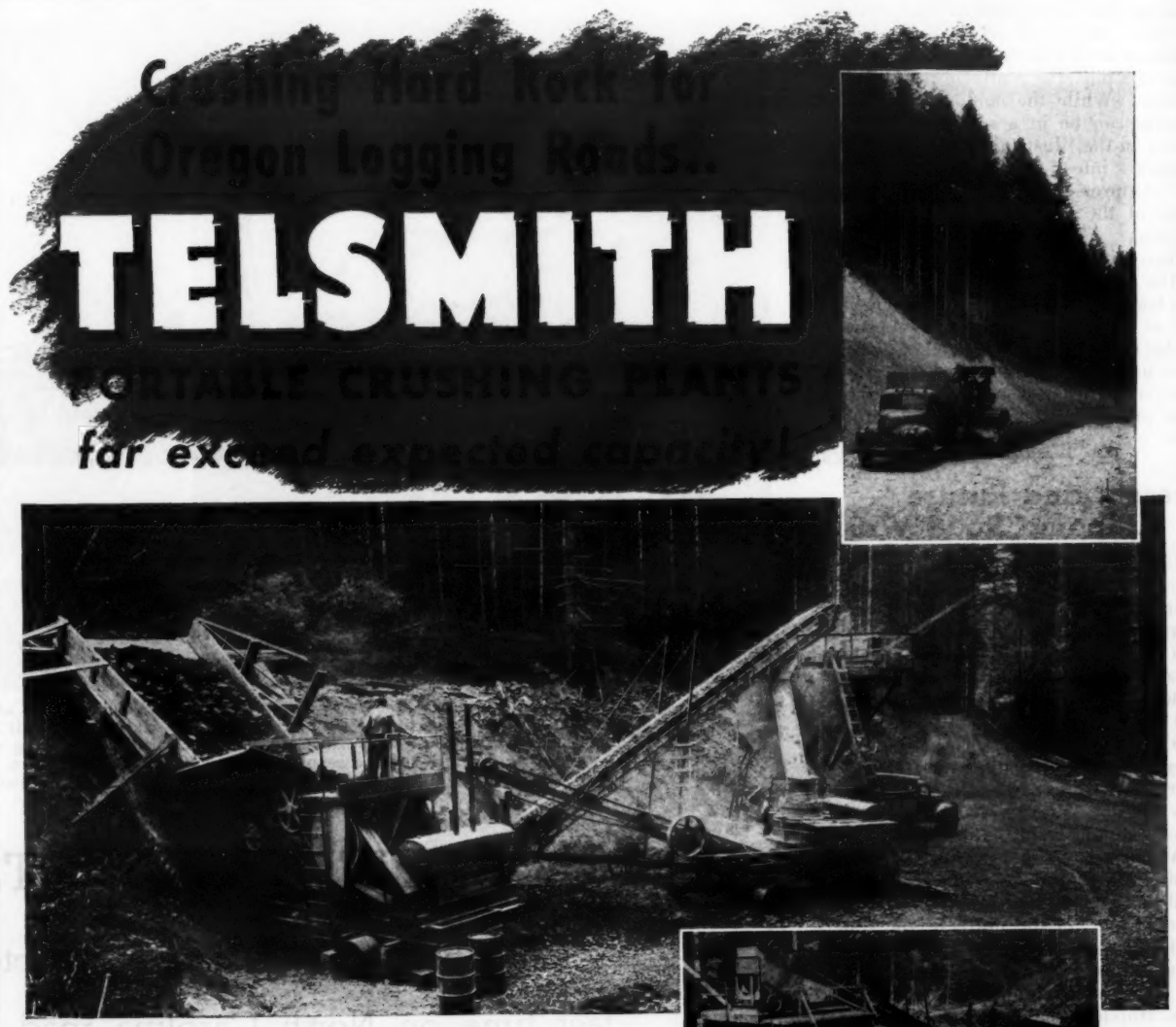
The Newburgh Project

Early in the post-war planning period, the Regional Association of Cleveland realized the complexity and magnitude of the transportation problem confronting the City of Cleveland and Cuyahoga County. To solve this complicated problem, the Association appointed an Express-Highway Sub-Committee of the Public Works Committee to study and produce a plan which will serve Cleveland's present needs and have sufficient scope to meet the requirements of anticipated traffic increases twenty years after the traffic volume resumes its 1941 level. Much local interest was manifested by this announcement of the Express Highway Plan and the immediate development of construction plans for the Newburgh Freeway. Representatives of governmental, commercial, religious, and civic organizations made numerous inquiries as to the effect of the proposed improvement on their respective interests.

To answer these queries, the Cleveland Planning Office of the State Highway Department decided to prepare a topographic map of the area as a base on which was illustrated in color the proposed construction. In addition, perspective drawings were made to supplement the plan map, illustrating such complicated construction as interchanges and freeway mergers. This method proved unsatisfactory to the layman, inasmuch as it lacked the element of the third dimension. For this reason it was decided that a model would be the best medium to present the design. On investigation it was learned that the established sculpturing concerns doing commercial work had insufficient experience in engineering model work to satisfy the specifications. Therefore, a sculptor was

(*Concluded on next page*)

To inform the public about the Newburgh Freeway Project in Cleveland, Ohio, a plan of the roadways was drawn to scale on sheets of plastic which were mounted above a model of the Newburgh section of the city so that by looking down through the transparent sheets, one secures a "phantom view" of the buildings affected. At left, the method of supporting the plastic sheets.



● To provide faster, more economical timber transportation, Weyerhaeuser Timber Co. is building its own roads and super-truck highways.

To turn out the required aggregate *fast* and *economically* they're using two Telsmith Portable Crushing Plants—one at Longview, Wash.—the other at their Molalla, Oregon operation pictured here.

Each is a Telsmith Two-Unit Portable Crushing-Screening Plant with an 18″ x 32″ Primary Jaw Crusher with feeder, a 28″ Intercone Secondary Crusher, conveyors, vibrating screen, power units, and steel bin.

These logging roads are being built to highway specifications. When producing a minus 4″ plus 1″ aggregate for base course and a minus 1″ for top course, with the Primary Jaw Crusher set at 3″, and 100 per cent of the material being crushed, these Telsmith Portable Plants average 75 cu. yds. per hr. When producing a straight minus 1″ aggregate for top course, they average 40 to 50 cu. yds. per hr. The rock is very hard and tough, but plant capacity has more than met expectations.

For private logging roads — or any highway anywhere—Telsmith Portable Crushing-Screening Plants will produce the aggregate more economically. *Get Bulletin P-34.* P-9

SMITH ENGINEERING WORKS, 4014 N. HOLTON STREET, MILWAUKEE 12, WISCONSIN

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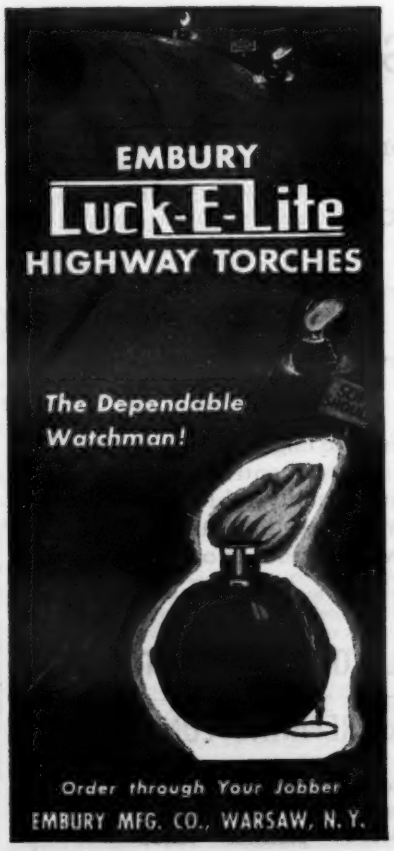
Brandeis M. & S. Co. Louisville 8, Ky. | Rish Equipment Co. Charleston 22, & Clarksburg, W. Va. | Rish Equipment Co. Roanoke 7, & Richmond 10, Va. | North Carolina Eqpt. Co. Raleigh and Charlotte 1, N.C. | Wilson-Weesner-Wilkinson Co. Knoxville 8, & Nashville 6, Tenn.



Model of Freeway Is An Aid to Engineers

(*Continued from preceding page*)

added to the staff to direct the construction of the model with the assistance of three employees, two of whom were art-school graduates working on displays and illustrations and the other a draftsman who had some knowledge of model construction.

Construction of Model

A wooden framework of the area under consideration was constructed according to a predetermined outline for the five sections which comprise the model. The edges of the sections were planned to fall along the center line of the streets, making it unnecessary to divide buildings. This method also provided a better means of concealing the joints between the sections in the assembled model. The surface of the framework was finished approximately ½ inch below the model surface and conformed to the topography of the area. One-half-inch mesh hardware cloth was placed over the frame surface and covered with loosely woven burlap over which plaster of Paris was poured and allowed to set.

A tracing showing the street system and building locations was placed over the plaster and transferred to the surface by means of carbon paper. The crown of the streets, sidewalks, rail lines, and other ground characteristics were then carved into the surface. Two coats of thin shellac were applied to seal the voids in the plaster. Artist's colored oil paints were used for the final surface.

Modeling clay was used to sculpture each building and, from this original, a glue mould was made. After the glue cooled, the clay model was removed and plaster of Paris poured into the mould and allowed to set. Two coats of thin shellac were applied to the plaster casting before painting. Burnt shellac was used as the adhesive to fasten the object to the base.

In order to give more emphasis to the railroad and trolley rails, black thread was glued into the grooves cut for the rails. The trees were fashioned from Statice plant and dipped into a solution of show-card and powder paint, glue and water.

Information pertaining to building dimensions and number of floors, chimney heights, etc., was obtained from the Fire Underwriters' atlases and supplemented by field observations. Photographs of the area provided the physical characteristics of the buildings, location of trees, billboards, automobile parking density, etc.

The model was constructed on a horizontal and vertical scale of 1 inch equals 30 feet, and represents an area of ¼ square mile. There are 528 separate buildings and 1,700 automobiles. The traffic shown is from actual count during the peak half-hour flow.

Plastic Overlay of Freeway

Plastic sheets, 20-inch x 50-inch x 0.060-inch, were laid over a plan of the freeway and the pavement outline was traced on the sheets with black India ink to which was added a few drops of acetate. Artist's paint was splattered on the under surface of the sheets between the curb lines to illustrate the pavement areas. Various colors were used to designate freeway, ramp, and local street pavements.

This plastic overlay, showing the freeway outline, was then placed over the model area to illustrate the extent of the new construction. The plastic sheets are supported on plastic pedestals of ¼-inch round stems, 5 inches high with ¾ x 1/16-inch plastic disks on both ends. A hole was drilled in one end of the pedestals to receive a 1/16 x ¼-inch screw which fastens the sheets to the pedestals. The other end of the support was glued to the model.

Value of Model

This model has proved to be most beneficial to the planning and design engineers in the development of detail construction plans and in providing a practical method of conveying the features of the proposed improvement to the layman. In addition to these benefits, it was more economical and feasible to create the model with the talent in the office than to contract it to commercial sculptors.

Mexico plans to spend $30,900,000 in highway construction and improvement during 1945, according to a Department of Commerce report. Preference will be given to four major highways which have already been started and are now in use over considerable distances, although several lesser routes connecting industrial, agricultural, and mining centers with trunk highways are included in the plans.

Rhode Island Is Ready With Approved Road Plans

Already plans for $2,000,000 of the post-war road and bridge program have been completed by the Division of Roads and Bridges, Rhode Island Department of Public Works, according to Daniel J. Ryan, Director. In addition, plans for $7,000,000 more in post-war road construction are being prepared as part of the total $20,000,000 post-war road and bridge program.

Rhode Island will receive $2,951,000 annually for three years under the present Federal-Aid bill. Of the first year's allotment, about $487,000 will become available immediately after allocations and appropriations by Congress for use in the further preparation of plans and in the making of surveys and acquiring right-of-way.

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Such as Dipper Teeth, Trencher Teeth, Gear Blanks, Levers, Tie Rods, Cranks, Crank Shafts, Special Shapes, etc. Forging weight range from 1 to 50 pounds.
Inquiries given prompt attention by our Engineering Dept.
MONDIE FORGE COMPANY INC.
10299 Berea Road Cleveland 2, Ohio

A grade-separation structure in Milwaukee, carrying two highways over the Chicago, North Shore & Milwaukee Railroad tracks which formerly crossed the highway intersection diagonally at grade.

Unusual Structure For Grade Crossing

Highway and bridge engineers of state highway departments, who will be facing some design problems for railroad grade-crossing elimination in post-war construction programs, might gather some helpful ideas by studying the way in which the Wisconsin Highway Commission overcame a dangerous traffic condition where the right-angle intersection of two county trunk highways was in turn intersected diagonally at grade by a railroad. The two main highways were elevated on a concrete and plate-girder structure which permits the flow of highway traffic at the road crossing, while the railroad is given a clear track below.

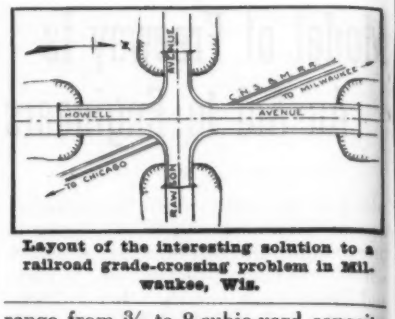
This bridge was designed and built before the war as a safety measure and has met with the general satisfaction and approval of the traveling public which will no doubt demand similar structures where comparable conditions exist. A consensus as to the most urgent need in post-war road work throughout the country indicates the elimination of highway and railroad intersections at grade as one of the principal items to be considered.

This unusual structure is located in Milwaukee County in east-central Wisconsin, and crosses the tracks of the Chicago, North Shore & Milwaukee Electric Railroad, over which operate high-speed electric trains. The length of the span carrying the road running north and south is 556 feet while the intersection east-west span is 250 feet. The roadways, which are carried 28 feet above the double-track railroad, are 36 feet wide with 5-foot sidewalks.

A total of 28,320 feet of 30-foot treated-timber piles was driven to support the footings for the reinforced-concrete bents and abutments. A typical footing for a bent is 48 feet long x 6 feet 6 inches wide x 3 feet deep, serving as a foundation for four reinforced-concrete piers 3 feet 6 inches square, spaced 14 feet on centers. Concrete caps carry the plate girders forming the spans for the 6½-inch concrete roadway slab. About 3,240 cubic yards of concrete masonry went into the superstructure, bents and abutments which were reinforced by 417,790 pounds of bar steel. Structural steel for the spans totaled 1,154,350 pounds.

The intersection of the roadways on the bridge is on a 2-degree vertical curve, making that portion of the floor very flat but affording 1,000 feet of vision, a very considerable safety factor. The 3-foot 3-inch height of the railing is also low enough to give motorists an unobstructed view when approaching the intersection.

This structure was designed by the Bridge Department of the Wisconsin Highway Commission under the direction of E. L. Roettiger, State Highway Engineer, and C. H. Kirch, Bridge Engineer. Construction was under the supervision of J. A. Stransky, Division Engineer of Division 2, with headquarters at Milwaukee. Paul A. Powers was Resident Engineer. The contractor was the Worden-Allen Co. of Milwaukee; the contract price was $192,712.70.

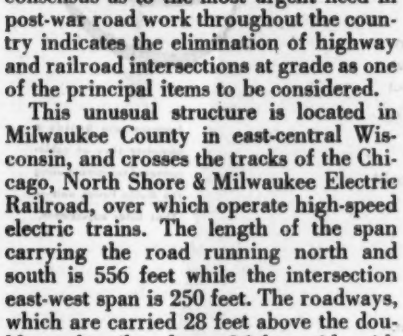


Layout of the interesting solution to a railroad grade-crossing problem in Milwaukee, Wis.

Dragline Buckets Shown At Work in New Catalog

A complete line of dragline buckets, constructed with round manganese-steel bumpers which prevent the arch from hitting the ground when the bucket is dumped, is described and illustrated in a 24-page catalog issued by the Daniels-Murtaugh Co., 625 C Ave., N.W., Cedar Rapids, Iowa. Features of these Draglines include a flat-top arch, designed to eliminate binding of material being loaded or dumped, and a 3-way hitch permitting three positions for fast, average, and precision dumping. The buckets are available in four types, for heavy, medium, all-purpose and light duty, and range from ¾ to 8-cubic-yard capacity. Accessory bucket equipment is also described, such as manganese-steel chains, fittings, and DMCO teeth for dragline buckets and dippers of all makes.

Dragliner buckets are built in the shops of the Universal Engineering Corp., Cedar Rapids, Iowa, but are designed and engineered by the Daniels-Murtaugh Co., which will be glad to send copies of Catalog No. 14, giving complete descriptions and specifications, on request. Just mention CONTRACTORS AND ENGINEERS MONTHLY.



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For complete details on Sullivan Hand Held Drills and other Sullivan equipment for contractors, see the nearest Sullivan distributor or branch office. SULLIVAN MACHINERY COMPANY, Michigan City, Indiana. In Canada: Canadian Sullivan Machinery Company, Ltd., Dundas, Ontario.

The Sullivan L-47, (45-lb. class), is similar in design to the L-57 and has the drilling speed and power of the average 55-lb. drill with holding qualities comparable to the average 35-lb. drill.

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★ LOW AIR CONSUMPTION
★ EASY OPERATION
★ LOW MAINTENANCE

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The Blaw-Knox batching plant used by S. S. Magoffin Co., Inc., Denver, Colo., in concreting the Continental Divide Tunnel of the Big Thompson Project in Colorado.

Concreting Tunnel At Estes Park, Colo.

The concreting of the 13-mile Continental Divide Tunnel from Grand Lake to Estes Park, Colo., is progressing rapidly as S. S. Magoffin Co., Inc., contractor of Denver, Colo., pushes the work. The inside diameter of the lining is 9 feet 9 inches for the entire length. The completion of the project (See C. & E. M., December, 1942, pg. 2) will provide irrigation water for additional land on the east side of the Rockies, using water gathered on the western slopes.

The batching plant used, made by the Construction Equipment Department of the Blaw-Knox Co., Pittsburgh, Penna., is a 300-ton unit with a three-compartment bin, while the bulk-cement bin has a capacity of 1,500 barrels and is equipped with an electrically driven elevator delivering 50 tons per hour. Aggregates are elevated into the batching bins by a long belt conveyor. Both the aggregate and cement weighing batchers are of 1-cubic-yard capacity.

The accurately weighed batches of both aggregate and cement are discharged into batch boxes on narrow-gage cars and hauled into the tunnel, where the concrete is mixed and placed in the tunnel lining. The Blaw-Knox Co. also provided the steel forms for the tunnel-lining work.

Line of Spreaders For Any Make Truck

Detachable spreader bodies designed to fit any make of truck, new or used, and capable of carrying and spreading evenly limestone, chips or cinders are being made in standard and junior sizes by Baughman Mfg. Co., Inc., Jerseyville, Ill. The Junior model will spread a width of 20 to 40 feet, depending on the speed of the truck. Model C is specially adapted for spreading chips or cinders and is for use only on dump-body trucks. The larger Models D and E, in lengths from 9 to 21 feet, also spread a width of 20 to 40 feet. A conveyor in the bottom of the bodies delivers the material at a uniform rate metered by the setting of the tail-gate.

Complete information on all models may be secured direct from the manufacturer by mentioning this news item.

1944 ASTM Standards

The 1944 Book of ASTM Standards which gives their latest approved form as of December, 1944, with more than 1,200 ASTM specifications, tests, definitions, etc., covering engineering materials and products, is now available. The book has again been issued in three parts: I, Metals; II, Nonmetallic Materials—Constructional; III, Nonmetallic Materials—General. Each part of the 1944 Book has a complete subject index from 36 to 44 pages. Any one part may be purchased for $10.00, any two for $20.00, and all three for $30.00. Late in 1945 a supplement will be issued to each part at $4.00 for each supplement.

Copies may be obtained from the American Society for Testing Materials, 260 South Broad St., Philadelphia 2, Pa.

Watertight Compound For Curing Concrete

A new concrete curing compound which provides a tough, watertight, elastic film that retards moisture loss and allows concrete to cure under proper conditions has been announced by Keystone Asphalt Products Co., 43 E. Ohio St., Chicago 11, Ill. This Kapco curing compound is reported to adhere immediately to the wet surface, does not crack or shrink, will not melt or soften, and does not sag or run under high temperatures.

Keystone reports that this product has been approved by Army and Navy engineers and that it is particularly easy to apply by spraying over newly laid concrete. Complete information may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

WINPOWER ELECTRIC PLANTS

MODELS 12 DL & 15 DL
110-VOLT D.C. MANUAL START

Immediate shipment from emergency stock on many models A.C. and D.C. 350 to 25,000-watt plants. Wire us your requirements.

Light, Safe and Portable
Sturdy and Compact in Construction
Simple in Design and Inexpensive to Operate

These models have extremely high output for their size and weight. They are recommended for portable work on road and construction jobs, repair depts., fire depts.; indispensable for lighting and operating of electric tools such as portable compressors, drills, saws, sanders, etc.

Send for catalog and Specifications

WIND POWER MFG. CO., NEWTON, IOWA

Making little ones out of big ones

PORTABLE PLANTS

Austin-Western Portable Crushing and Screening Plants are made in a wide variety of types and sizes; each complete with whatever is required in the way of conveyors, screens and bins.

• Key to the successful and profitable operation of any plant is the crusher itself . . . reason enough for the painstaking engineering behind every Austin-Western jaw and roll model.

Exclusive features increase output, assure constant operation and reduce maintenance costs.

The same skilled engineering characterizes each and every Austin-Western crushing and screening plant, from the most simple to the most elaborate; each tailor-made to the requirements of a particular production problem.

AUSTIN-WESTERN COMPANY,
AURORA, ILLINOIS

TWO-UNIT AND THREE-UNIT PLANTS

Suitable for either pit or quarry use, these plants are capable of delivering highest tonnages of aggregate in accurately controlled sizes. Frequently, each unit is capable of producing material that meets job requirements, in which case the individual units can be used separately as shown in the photographs above. Such flexibility of operation spells maximum profits for the owner.

BUY MORE WAR BONDS

Single-Double-Drum Hoists for Tractors

A series of bulletins has been published by Pacific Car & Foundry Co., Renton, Wash., on its single and double-drum hoists of various capacities for Allis-Chalmers, Caterpillar, Cletrac, and International tractors. All gears are of alloy steel accurately machined and heat treated, and all shafts turn in oversize double and single row ball bearings. The use of Carcometal for the housing guards the hoist mechanism from damage, and all gears and shafting run in a continuous oil bath.

The details of the various models may be secured by writing to the manufacturer and specifying the type of tractor for which the hoist is desired. Please mention this item.

New Haiss Dealers

The George Haiss Mfg. Co., Inc., New York City, maker of a line of excavators, loading equipment, elevators, conveyors, sand and gravel handling machinery, and similar equipment, has just announced the appointment of the following distributors: The Coast Equipment Co., 948 Bryant St., San Francisco 1, Calif.; Union Tractor & Harvester Co. Ltd., 9th Ave. & 8th St. W., Calgary, Alberta, Canada; Plains Machinery Co., 411-13 Broadway, Plainview, Texas; G. C. Phillips Tractor Co., 1909½ First Ave. No., Birmingham, Ala.; Herman M. Brown Co., 903 17th St., Des Moines 4, Iowa; Harrod Equipment Co., 4200 S. Salina St., Syracuse 5, N. Y.; and A. M. Flanders, Inc., 207 No. Main St., Barre, Vt.

Manganese-Steel Fronts Feature Dippers, Buckets

Shovel dippers, pull-shovel dippers, and dragline buckets constructed with solid manganese-steel fronts and reversible socket-type teeth of manganese steel are described and illustrated in a 4-page folder from the Pettibone Mulliken Corp., 4700 West Division St., Chicago 51, Ill. Body sections of tapered design make it easy to dump wet, sticky material, according to the manufacturer, and the welded fabrication of body sections saves burdensome weight up to 30 per cent, which permits longer booms and greater digging speed. Shovel dippers are available in ⅜ to 18-yard sizes; pull-shovel dippers in ½ to ¾-yard; and the dragline buckets in ½, ¾, 1, 1½ and 2½-yard capacities.

Interested contractors and engineers may secure copies of this folder, "A Big 3 in the Material Handling Field", by writing direct to the manufacturer.

Detrex Shifts Cooper To New England States

Joel N. Cooper has been transferred from Michigan to the New England territory of the Alkali Division of Detrex Corp., Detroit, Mich., maker of alkali and emulsion cleaning compounds, solvent degreasers, metal parts washers, and chlorinated solvents.

Mr. Cooper, who has been with the organization since 1940, will maintain headquarters in Meriden, Conn., and will supervise sales of alkali and emulsion cleaning materials in this territory.

At LeRoi there is a new WHITE star . . . our third citation for meritorious war production

We are happy to display this additional star on our Army-Navy "E" pennant because it is an external symbol of continued excellence in war production and a tribute to our employees for the splendid job they have done. • It is also a reminder — a memorandum to construction men everywhere — that Le Roi Compressors are still going to war and winning laurels on fighting fronts. • However, there is a small percentage of Compressors, Engines and Engine Driven Generators being produced and allocated according to government regulation to those who can qualify as essential users.

Ask your Le Roi distributor for details.

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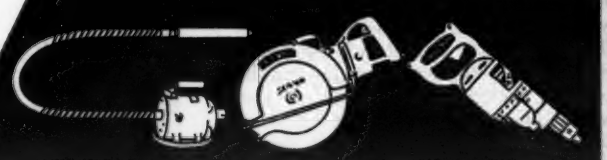
JACKSON Portable Power Plants are backed by 25 years of dependable service to construction men. They are rugged, simple in construction and design and require only ordinary common sense maintenance . . . Available with wheels or plain skid mounts. JACKSON Portable Power Plants are made in 5,000, 2,000 and 750 watt sizes, generating 110-120, single phase and 3 phase, 60 cycle A.C. for operating light and heavy duty motors, vibrators, tampers, drills, saws, grinders and the like. Contractors will find these versatile plants ideal for lighting service on night or emergency jobs, for semi-permanent or permanent work in maintenance shops or tool cars. Voltage and frequency are quickly varied by engine governor adjustment.



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Labor's Cut of Money For Post-War Roads

About 26 per cent of the annual expenditures under the post-war Federal-Aid highway program will be for labor at the construction sites, according to statistics released recently by the Associated General Contractors of America. Under the three-year post-war program, $500,000,000 in Federal funds is apportioned among the states each year on a 50-50 matching basis, thus providing approximately $1,000,000,000 annually for the national program.

One of the chief purposes of the highway program is to provide post-war employment, and according to the AGC studies the program will provide annually 95,750 man-years of direct on-site labor, and 215,600 man-years of indirect off-site labor, based on 1940 prices.

As to the spread of business activity resulting from the highway program, business transactions involved in handling and processing materials and equipment used in road construction approximates three times the total highway expenditure, which would mean about $3,000,000,000 each year during the three-year program. Expenditures for materials per year under the program would total about $443,000,000 or about 44 per cent of the cost of the annual program.

APPROXIMATE EXPENDITURES FOR LABOR AND MATERIALS PER YEAR UNDER THE THREE-YEAR FEDERAL-AID HIGHWAY PROGRAM

(Based on 1940 Prices)

Expenditures for:	
Labor at the construction site (26 per cent)	$258,000,000
Materials (44 per cent)	443,000,000
Other expenses (30 per cent)	299,000,000
Value of materials:	
Iron and steel products	$112,100,000
Sand and gravel	100,600,000
Cement	92,100,000
Paving materials and mixtures	44,300,000
Lumber and timber products	22,200,000
Stone and clay products	12,100,000
All other materials	59,600,000
Total (all materials)	443,000,000

APPROXIMATE EXPENDITURES FOR LABOR AND MATERIALS PER YEAR UNDER THREE-YEAR POST-WAR FEDERAL-AID HIGHWAY PROGRAM BY STATES

(Based on 1940 Prices—In Thousands of Dollars)

State	On-Site Labor	Materials	Other Expenses	Total
Ala.	$ 5,032	$ 8,640	$ 5,832	$19,504
Ariz.	2,980	5,044	3,438	11,462
Ark.	3,910	6,618	4,512	15,040
Calif.	11,614	19,656	13,402	44,672
Colo.	4,004	6,776	4,620	15,400
Conn.	2,156	3,650	2,488	8,294
Dela.	1,058	1,790	1,220	4,068
Fla.	3,642	6,164	4,204	14,010
Ga.	6,026	10,196	6,952	23,174
Idaho	2,566	4,346	2,962	9,874
Ill.	12,058	20,406	13,914	46,378
Ind.	6,300	10,662	7,270	24,232
Iowa	5,810	9,832	6,704	22,346
Kansas	5,594	9,466	6,454	21,514
Ky.	4,634	7,840	5,346	17,820
La.	3,856	6,526	4,450	14,832
Maine	2,036	3,446	2,350	7,832
Md.	2,498	4,226	2,880	9,604
Mass.	5,396	9,132	6,226	20,754
Mich.	8,676	14,680	10,010	33,366
Minn.	6,470	10,948	7,466	24,884
Miss.	4,146	7,018	4,784	15,948
Mo.	7,484	12,666	8,636	28,786
Mont.	4,140	7,004	4,776	15,920
Nebr.	4,382	7,416	5,056	16,854
Nev.	2,524	4,272	2,912	9,708
N. H.	1,198	2,030	1,384	4,612
N. J.	4,922	8,328	5,678	18,928
N. M.	3,332	5,638	3,844	12,814
N. Y.	17,676	29,914	20,396	67,986
N. C.	5,914	10,008	6,824	22,746
N. Dak.	3,114	5,270	3,592	11,976
Ohio	10,474	17,726	12,086	40,286
Okla.	5,288	8,950	6,102	20,340
Ore.	3,686	6,240	4,254	14,180
Penna.	13,022	22,038	15,026	50,086
R. I.	1,536	2,602	1,774	5,912
S. C.	3,234	5,474	3,732	12,440
S. Dak.	3,258	5,516	3,760	12,534
Tenn.	5,218	8,830	6,020	20,068
Texas	14,964	25,322	17,266	57,352
Utah	2,420	4,096	2,792	9,308
Vt.	1,048	1,774	1,210	4,032
Va.	4,578	7,746	5,280	17,604
Wash.	3,856	6,524	4,450	14,830
W. Va.	2,786	4,716	3,216	10,718
Wis.	6,112	10,342	7,052	23,506
Wyo.	2,512	4,252	2,900	9,664
Hawaii	1,156	1,958	1,334	4,448
D. C.	1,550	2,622	1,788	5,960
P. R.	1,602	2,712	1,848	6,162

Federal Government reserved $12,500,000 for administration and engineering.

Vacuum Power Brakes For Trucks, Tractors

A pre-war product which was never announced to the public but which will be ready for civilian use immediately at the end of the war is described in a new booklet Form 9-255 issued by Bendix Products Division, Bendix Aviation Corp., South Bend, Ind. This Hydrovac braking system is a complete vacuum power brake system comprising a power cylinder, control valve, and a hydraulic cylinder, all combined into one self-contained sealed unit. It is connected into the vehicle hydraulic-brake line at any point between the master cylinder and the brake-wheel cylinders. In this way, two hydraulic lines connect to the Hydrovac; one from the master cylinder, the other from the wheel cylinders. Foot pressure on the brake pedal hydraulically controls the power output of the Hydrovac; a hydraulic line from the Hydrovac goes to the wheel cylinders and serves to apply the brakes of the vehicle.

The bulletin referred to contains sectional views of the Hydrovac system, and numerous illustrations of various sizes and types showing the adaptability of the design. Copies of the bulletin will be sent promptly to readers who write direct to the manufacturer and mention this item.

HOBART "Simplified" Arc Welders
DO ALL THIS in Less Time
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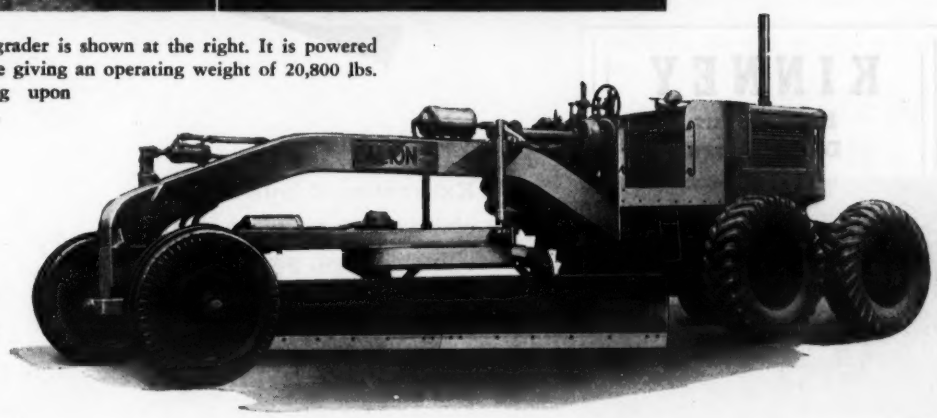
View at far left shows a big Galion motor grader ditching in reverse. Immediate left—Galion No. 101 motor grader doing a bit of road widening on a strategic highway out West.

A Galion No. 101 motor grader is shown at the right. It is powered by a 68½ HP diesel engine giving an operating weight of 20,800 lbs. to 23,000 lbs. depending upon equipment and accessories.



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Left: Bank cutting—Blade adjusted for high bank cutting. Can be set at any desired angle up to 90°. Right: Ditch sloping—blade adjusted for low bank cutting or sloping operations.

Method of Repairing Concrete Flood Wall

(*Continued from page 2*)

Excavation

When a 40-foot section of wall was selected to be rebuilt, a derrick boat, the DB-3, was moved in to excavate on both sides of the wall. On the rear or land side of the wall the DB-3 dug a trench 6 feet deep and 3 feet wide for the entire 40-foot length of the section. Any failures, such as scaling, cracking, or disintegration, on the land side were thus noted. On the river side the DB-3 removed all mud and silt for an 18-foot width in front of the wall until the shale and the rocky bottom of the river were bared.

Derrick boat DB-3 is a sturdy craft 75 feet long, 25 feet wide, and 6½ feet deep, with an all-steel hull. The derrick, which is swung from an A-frame 35 feet high in the bow of the boat, has a 50-foot boom capable of moving in an arc of 180 degrees, and can pick up a 15-ton load. The boat is not self-propelled but is towed into place by a State tug. A Williams 1-yard clamshell bucket is worked from the end of the boom. Steam for the 3-drum winch is supplied at 150-pound pressure by an Ames-Oswego economy-type boiler fired by fuel oil. The Clyde winch has two steam cylinders of 9-inch bore, 12 inches long. The boat has a 4,500-gallon fuel tank. It is lighted at night by a Kohler 110-volt electric plant. A white-oak spud, 25 feet long and 12½ inches square, on each side of the bow outside the hull steadies the boat while digging is in progress. A Dake steam engine powered from the main boiler raises or lowers the spuds as the occasion requires. When the boat must pass beneath one of the low bridges over the canal, the spuds are lifted out by the derrick and placed on an accompanying scow so that bridge clearance is provided. The A-frame too must be let down and placed on one of these scows. A nine-man crew, including the captain and cook, is the complement of the DB-3.

Two all-steel scows, 100 feet long, 26 feet wide, and 7 feet deep, with a capacity of 250 yards each, worked with the derrick boat and were loaded with the mud and silt which was removed from the river. This excavated material was later used to fill in low areas along the river bank.

When excavating in front of the wall, the captain of the DB-3 left a 2 or 3-foot shelf of mud or silt where the sheet piling of the cofferdam was to be driven. In this manner a tight fit could usually be obtained around the bottom of the cofferdam. If a leak developed, more material was placed around the outside of the piling.

Steel Frame for Cofferdam

In order to get working space around the face of the wall for removal of the old concrete and the placing of the new, a steel frame weighing 11 tons was used. This frame, which braced the sheet-pile cofferdam to resist the outside water pressure, was designed by the Division of Engineering of the State Department of Public Works. Two such frames were made but only one was used in 1944. Because of the man-power shortage, only one section of wall was worked on at a time.

The frame consists of two trusses, upper and lower, lying flat and connected on three sides by vertical sections, and is 45 feet long x 13 feet wide x 11 feet 4 inches high from center to center of truss. The lower truss consists of a longitudinal member, a 12 x 6½-inch wide-flange (WF) I-beam weighing 36 pounds per foot, and two end members each 14 x 10-inch WF I-beams weighing 68 pounds. These main members are then cross-braced by seven double sets

A corner of the cofferdam showing the disintegrated face of the concrete river wall at Rochester, N. Y. In the corner is one of the 5 x 5-inch WF I-beam posts which support the steel frame holding the cofferdam.

(*Continued on next page*)

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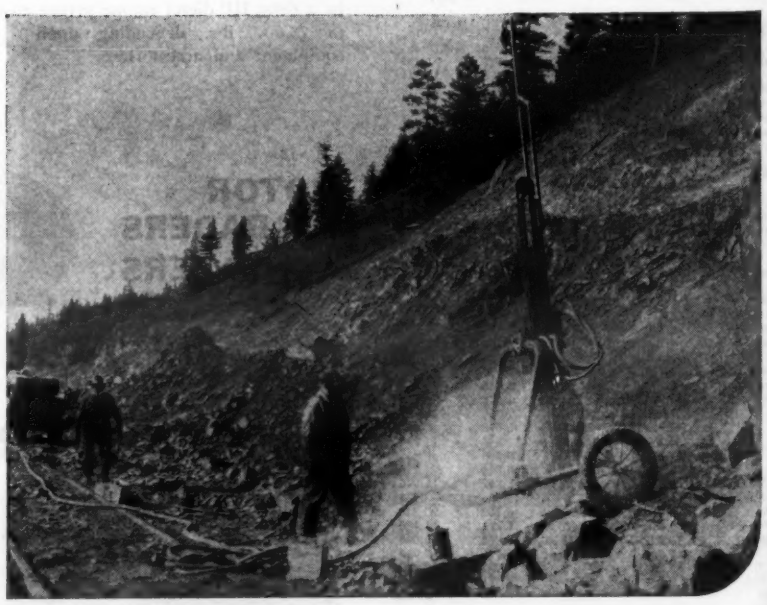

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Method of Repairing Concrete Flood Wall

(*Continued from preceding page*)

of various-sized angles. The upper truss is of lighter construction, the longitudinal member being a 10 x 5¾-inch WF 21-pound I-beam, and the end pieces of 10 x 8-inch WF 33-pound I-beam. The vertical section between trusses is made up of 4 x 4 x 5/16-inch angles or lighter. When the frame is set in place, the end members of each truss bear against the wall beyond the ends of the block which is to be repaired. The frame is supported on four posts made of 5 x 5-inch WF 18.9-pound I-beam, 18 feet long. These posts are lowered to rest on the rock bed of the river. In the upper end of the posts are twelve 2-inch holes on 6-inch centers through the web. By means of pins stuck through these holes and bearing on the upper truss, the whole frame is held at the proper elevation.

The derrick boat lowered the frame into position with its open end against the wall to be reconstructed. Steel sheet piling, 24 feet long, was driven against the other three sides of the frame. This piling was Bethlehem section AP3, 19⅝ inches wide, weighing 36 pounds per linear foot. The piling was lifted into place by the ever useful derrick boat and interlocked before driving by a McKiernan-Terry No. 6 hammer operated by steam from the boiler on the DB-3. Driving started with the third or fourth pile from the face of the wall so that the piles closest to the wall were driven last. This was done so that any difficulty in getting a tight fit could be taken care of with the especially designed end piles. Piles were driven to rock which forms the river bottom. In some sections along the east bank of the Genesee a huge gantry crane on rails was used to set the piles in place but driving was done by the steam hammer and a portable steam boiler.

Unique Shutter Pile

The section of sheet piling immediately adjacent to the concrete wall was composed of two sheet piles locked together. In order to make a tight fit with the uneven wall surface caused by disintegration, the end pile was fitted with twenty-two shutters made of 6-inch channels. These shutters were bolted to the pile but slid back and forth in a horizontal plane in specially cut slots. After the sheet piling had been driven, a diver went down and slid these shutters over until they were in contact with the face of the concrete and then tightened the bolts that held them to the sheet pile. The lower 5 feet of the pile was cut to fit against a 5 on 1 batter on the face of the concrete wall.

In 1944, the regular State diver had resigned his job and no one was available for this work. Pete DeYaeger, 47-year-old foreman of the maintenance crew which was doing the work, volunteered to take over the diving. Clad in a combination rubber and canvas diving outfit with steel helmet into which was fitted a two-way telephone system, this former steeplejack and ex-WPA worker went down the ladder into 13 feet of water with a hammer and wrench hanging from his shoulder. He hammered the steel channel shutters against the wall and then bolted them securely in place. This operation took about half an hour on each side.

The cofferdam was then unwatered by means of four pumps: a 10-inch Jaeger with a Hercules engine; 4 and 6-inch Sterling pumps with Waukesha engines; and a 3-inch Sterling pump with a Wisconsin engine. The unwatering took about an hour, and after it was pumped dry it was kept that way by constant operation of one of the smaller pumps. When this wall repair work was first started, a pump boat was used for unwatering the cofferdam. On this boat were a 6-inch and an 8-inch centrifugal pump driven by electric motors operating from a generator powered by a gas engine. This method was later discarded in favor of the four smaller pumps which were set up on the upper truss of the cofferdam frame. An all-steel flat scow, 70 feet long x 25 feet wide x 5½ feet deep, carrying the air compressors and a tool shed, was moored alongside the sheet piling. A similar scow was used to stock material.

Single-wall cofferdams are usually hard to seal but a tight job was effected here by dumping bags of cinders outside the cofferdam at any leaks through the sheeting. This was augmented on the inside by piling broken concrete from the walls around any spots which showed signs of leaking.

Concreting

Using the steel frame for support, scaffolds were built along the face of wall, from which the workmen could operate their jackhammers to cut away the poor concrete. Three men stood on top of the wall and supported the hammers by ropes while three other men on the scaffold operated the hammers in a horizontal position. One Worthington and two Ingersoll-Rand jackhammers with 1¼-inch bull-point drills were employed, and were driven by an Ingersoll-Rand and a Worthington air compressor. All the deteriorating concrete was cut away in this fashion until the hard and solid concrete was reached.

The rear of the wall is reinforced by ¾-inch round bars 5 feet long, spaced 18 inches on centers. The ends of these bars were set into the existing concrete to a depth of 18 inches and grouted in place. Into the face of the wall were set ½-inch round anchor rods spaced 2 feet on centers both ways. Holes for

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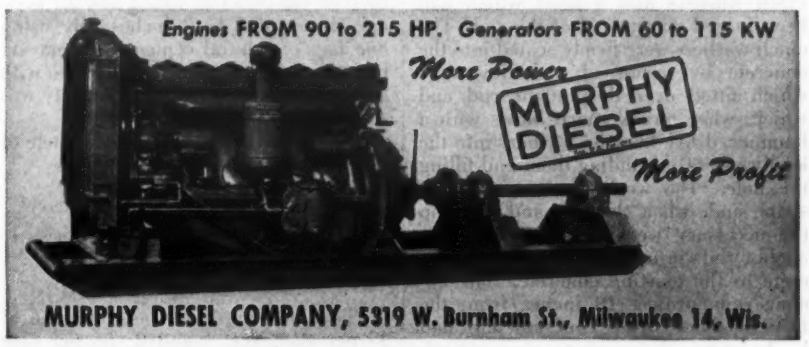
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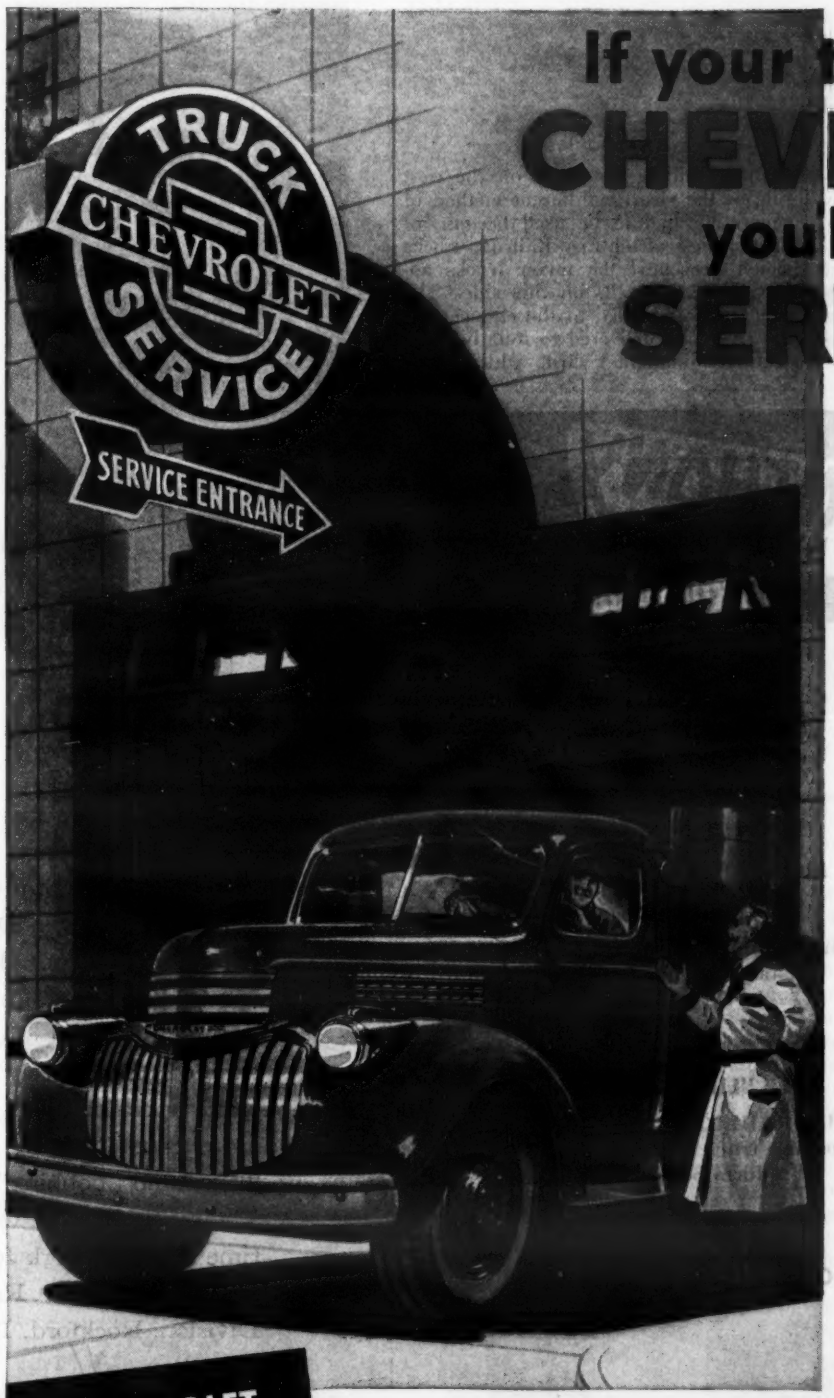

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Method of Repairing Concrete Flood Wall

(*Continued from preceding page*)

these anchor rods were made by 1-inch pneumatic drills. On the end of the rod which was inserted into the hole were three sets of combination iron and lead cinch washers and a head which had been forged on one end of the rod. The cinch washers were firmly seated into the concrete by means of a hollow tube which fitted over the anchor rod and which, when struck sharp blows with a hammer, drove the iron washers into the lead washers, expanding them and filling the hole. The washers are conical in shape and, when they expand, develop the necessary working strength of the anchor rods in order to tie the new concrete to the existing concrete. The anchor rods project 18 inches from the face of the existing concrete and had hooks bent in their ends to support horizontal ½-inch round bars which run the length of the wall. Vertical reinforcing in the front face consists of ¾-inch round bars, 10 feet long and spaced 18 inches on centers. Form ties, ⅜-inch round bars, were fastened to the hooked ends of the anchor rods.

Wooden forms for concreting were made from 8 x ⅞-inch tongue-and-groove stock. These were backed by 2 x 4 studs 20 inches on centers. The studs were supported by double 2 x 6 wales on 2-foot centers. For easier handling, the forms were built in panels 15 feet 2 inches long x 5 feet 7½ inches wide, and 10 feet long x 5 feet 7½ inches wide.

Truck-mixed concrete for the 1944 work was supplied by the Concrete Trans-Mix Corp. of Rochester. About 40 cubic yards was used in each river block, supplied by four 4-cubic-yard trucks. The concrete was chuted from the trucks into the forms and the actual concreting of each block took from 4 to 5 hours. The pouring was done in 2-foot lifts, the trucks moving 5 feet along the wall for each pour. An Ingersoll-Rand pneumatic vibrator was used in the concrete which had an average slump of 2 to 3 inches. By using one bag of natural cement to every six bags of portland cement a concrete with a lower slump and more workability was secured.

The weight of a cubic-yard batch of this concrete was as follows:

Item	Pounds
Natural cement	76
Portland cement	455
Sand	1,260
Stone (No. 1, 2 and 3A)	2,170
	3,961

The stone aggregate was composed of 45 per cent Nos. 1 and 2; 55 per cent No. 3A. These stone sizes are:

No. 1: 100 per cent passing 1-inch; 90-100 per cent passing ½-inch; 0-15 per cent passing ¼-inch.
No. 2: 100 per cent passing 1⅞-inch; 90-100 per cent 1-inch; 0-15 per cent passing ½-inch.
No. 3A: 100 per cent passing 2¼-inch; 90 to 100 per cent passing 1⅞-inch; 0-15 per cent passing 1-inch.

Obstacles

In rebuilding the walls on the west side of the river, a different method of concreting had to be used because of the nearness of the Erie Railroad tracks which prevented the mixer trucks approaching the walls on this side. The concrete was hauled to the east side of the river and delivered to four buckets, each holding one yard, which were placed on the deck of a scow. The scow in turn was pushed across the river by a tender and the buckets of concrete dumped into the forms by the derrick boat.

The completion of all operations on a block usually took about 15 days. Because of the high water in the spring, the work could not be started much before June when the floating equipment could be brought in. Cold weather in the autumn shut down concrete operations early so the maintenance crew had but a short season in which to work. The work started with two cofferdams but the labor shortage during 1943 and 1944 resulted in having barely enough men to conduct operations with one cofferdam.

Personnel

E. C. Lawton is District Engineer for District No. 4 of the New York State Department of Public Works, with headquarters at Rochester. The restoration of the concrete walls is under the direction of William Zabel, Senior Civil Engineer, and Charles Scutt, Assistant Civil Engineer. The ingenious equipment used in this restoration work was designed by Mr. Scutt. The completion of the work in 1944 covered all the really bad sections of the wall, but it is expected that in another five years more blocks will be in need of attention.

New Distributor Firm Opens at Philadelphia

Evans Machinery & Equipment Co., organized by Louis Levenson, who terminated his position with the War Production Board as of January 17, 1945, and S. Howard Evans, who will join the organization as soon as his connection with the War Production Board ceases, has opened its offices at 770 So. Schuylkill Ave., Philadelphia 46, Pa.

This new distributor organization will handle the products of Four Wheel Drive Auto Co., Contractors Machinery Co., Inc., Wm. Bros Boiler & Mfg. Co., E. D. Etnyre & Co., and other highway equipment lines.

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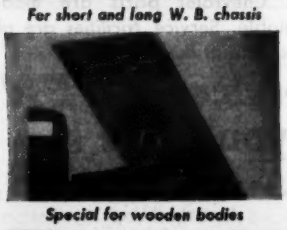

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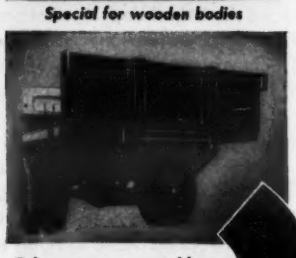

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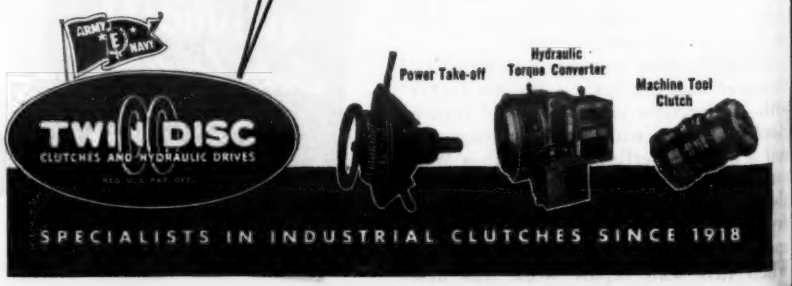

Tyson Appointments

Harry L. Vines, formerly Western Manager for R. G. LeTourneau, Inc., at Stockton, Calif., has been appointed Director of Sales by the Tyson Bearing Corp., Massillon, Ohio, where he will supervise sales operations in the automotive, industrial, and railroad fields. Before joining LeTourneau in 1940, Mr. Vines had previous sales-management experience with the Master Equipment Co., and later with the Caterpillar Tractor Co.

George C. McMullen, for many years a Vice President in charge of industrial sales, has been appointed Assistant to the President of Tyson. In his new post he will have charge of product research and development where his broad knowledge of the field will be directed to the improvement of Tyson products.

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Free circulation of this book is restricted to engineers and welding department supervisors. Shop superintendents may write to Victor on their business letterheads to secure their copies.

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These units have been thoroughly job-tested on a variety of earth-moving projects and under all types of operating conditions. Experience proves that: (1) You get fast acceleration even with heaping loads. (2) You cut round-trip time and secure top operating efficiency, particularly on long hauls. (3) You get a fast, positive discharge by a leverage action that exerts a *low line-pull* on the unloading cable.

These are a few of the reasons why Heil Hi-Speed Cable Scoops have gained such widespread acceptance throughout the dirt-moving industry. You can profit by the example of other successful dirt movers by adding these efficient Heil units to your equipment. *Write for bulletins* or —

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Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Where Does the Contractor Stand In Matter of Subsurface Conditions?

It is about time that public authorities in charge of public works either refrain from making any representations as to subsurface conditions existing at the site of a job or refrain from subsequent attempts to escape liability on the ground that the contractor *was warned not to believe what he was told.*

A typical instance of how contract phrasing has been used in an effort to prevent a contractor from recovering extra compensation to which he is justly entitled is presented by the case of the Pennsylvania Turnpike Commission v. Smith, 39 Atl. 2d, 139, decided by the Pennsylvania Supreme Court. Incidentally, the opinion of the court indicates that the *law* on this subject, as well as common notions of *justice*, is so clearly in favor of the contractor that there is no longer any excuse for relitigating it over and over again.

Notice that bids would be received for the construction of a section of Turnpike allowed only eleven days for site inspection, etc. The defendants examined the site as completely as this time permitted and relied upon information in the plans and specifications, which indicated that the material to be excavated would consist principally of loose earth with some limestone visible at one end of the site. It was brought out that the Commission's engineers knew that the subsurface was predominately rock. The additional cost of working the unexpected rock was reflected in an award of nearly $150,000, exclusive of interest, made by arbitrators in favor of the contractors.

"It Is So, but Don't Believe It"

In attacking the award before the Pennsylvania Supreme Court, attorneys for the Commission relied upon instructions to bidders, containing this self-contradicting paragraph: "Wherever subsurface-materials information is indicated on the drawings, it is understood that it was obtained in the usual manner and with reasonable care, and the location, depths, and the character of the material have been recorded in good faith. There is no expressed or implied agreement that the depths or the character of the material have been correctly indicated and bidders should take into account the possibility that conditions affecting the cost or quantities of work to be done may differ from those indicated." (The court found as a fact that it would have taken anywhere from four to eight weeks for the defendants to have made a complete and independent investigation, and that they were therefore compelled to rely on the plans as to subsurface conditions.)

"Under all the facts of this case," concluded the Supreme Court, "the representations of the Turnpike Commission amount to a constructive fraud upon the contractor and it was proper to award the additional cost incurred by the contractor as a result thereof."

U. S. Supreme Court's View

The Pennsylvania Supreme Court pointed out that a similar conclusion was reached by the highest court of the land in an opinion rendered more than thirty years ago. (Hollerbach v. United States, 233 U. S. 165.) In that case specifications for the reconstruction of a dam stated that the old dam was backed with broken stone, sawdust and sediment, while in fact the backing consisted of sediment for 7 feet and below that was a cribwork of logs filled with stones. But the contract warned bidders to inform themselves as to the actual condition of the backing of the dam. Ruling that the contractors were entitled to damages covering the extra cost involved in doing the job, the country's highest tribunal declared what on its face is common sense and simple justice:

"We think this positive statement of the specifications must be taken as true and binding upon the government, and that upon it, rather than upon the claimants, must fall the loss resulting from such mistaken representations. We think it would be going quite too far to interpret the general language of the other paragraphs as requiring independent investigation of facts which the specifications furnished by the government left in no doubt. If the government wished to leave the matter open to the independent investigation of the claimants, it might easily have omitted the specification as to the character of the filling back of the dam."

A few years after rendition of the last cited decision came another, also rendered by the United States Supreme Court. (Christie v. United States, 237 U. S. 234.) There the government furnished boring sheets to bidders on the construction of locks and dams on an alluvial stream. The court decided that the contractors were entitled to rely upon the accuracy of the boring sheets and to collect extra pay for resulting deception. Here, too, was stressed the point that bidders had not been afforded sufficient time to make independent borings. That helped nullify a clause in the specifications that bidders must satisfy themselves as to the nature of material to be encountered.

To the same general effect is a still later decision of the highest court of the land rendered in a case involving dredging. (United States v. Atlantic Dredging Co., 253 U. S. 1.) Still other precedents on the same point will be found cited in the opinion of the Pennsylvania Supreme Court in the Turnpike case discussed at the commencement of this article.

Special Clause Made Difference

But another decision of the Pennsylvania Supreme Court shows that where specifications explicitly declare that certain data have been secured for the *exclusive use of the public agency* letting the particular job, the contractor must satisfy himself as to what lies under Mother Nature's epidermis or gamble on it. In that case (O'Neill Construction Co. v. City of Philadelphia, 6 Atl. 2d, 525), boring sheets pertaining to a sewer job were secured for the City's own exclusive use and bidders were informed by the specifications that the information shown by them was no part of the contract, and that the contractor could not assert that he was misled by that information because it appeared on the plans. The court said that, "Since the plans were, by reference, a part of the contract, this statement" in the specifications "was equivalent to notice that the information furnished by the borings was not to be considered as a part of the plans. In effect, therefore, the borings were as much obliterated from the plans as if physically erased, and their appearance thereon was relegated to the status of private memoranda for the City's own purpose."

In considering this subject, it is to be borne in mind that, basically, the contractor is entitled to no information or guaranty from the other party as to the existence or non-existence of certain subterranean conditions. As said by the Pennsylvania Supreme Court in the last cited case: "Ordinarily, a contractor is presumed, in the absence of an express provision to the contrary, to have assumed the risk of unforeseen contingencies arising during the course of the work, unless performance is rendered impossible by an act of God, the law, or the other party."

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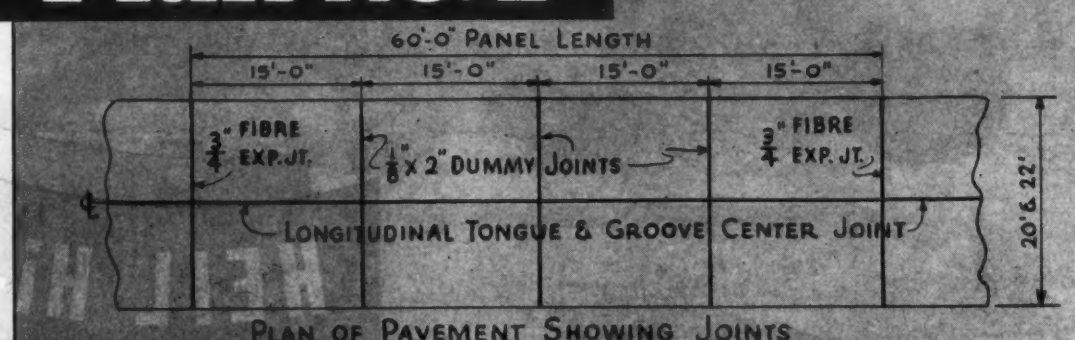
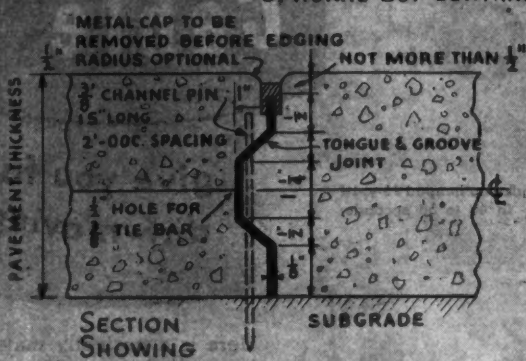
Plan No. 2

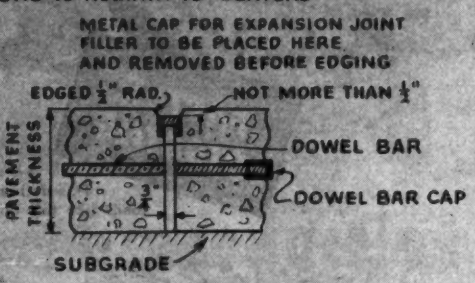


PLAN OF PAVEMENT SHOWING JOINTS

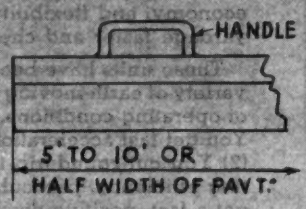
NOTE:- LENGTH OF PANEL BETWEEN EXPANSION JOINTS OPTIONAL BUT CONTRACTIONS TO REMAIN 15' CENTERS

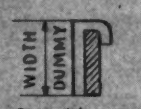


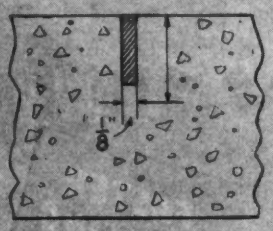
SECTION SHOWING TONGUE & GROOVE LONGITUDINAL CENTER JOINT & CONTRACTION JOINT


METAL CAP FOR EXPANSION JOINT FILLER TO BE PLACED HERE AND REMOVED BEFORE EDGING
EDGED 1/2" RAD.
NOT MORE THAN 1/4"
DOWEL BAR
DOWEL BAR CAP
PAVEMENT THICKNESS
SUBGRADE

SECTION SHOWING FIBRE TRANSVERSE EXPANSION JOINT







SECTION SHOWING DUMMY JOINT

NOTE:- ALL FIBRE EXPANSION JOINTS SHALL CONFORM TO AASHO SPEC. M-59-42

LONGITUDINAL CENTER JOINTS SHALL BE ASPHALT MASTIC BOARD AS MANUFACTURED BY KEYSTONE ASPHALT PRODUCTS CO. OR EQUAL AS APPROVED DUMMY JOINTS SHALL BE MADE FROM KEYSTONE ASPHALT MASTIC BOARD. WIDTH CAN VARY FROM 2" TO 1/4 PAVT. THICKNESS

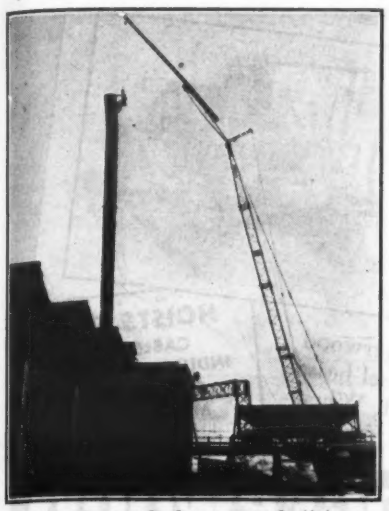
DETAILS OF PAVEMENT SHOWING JOINT LAYOUT - SUGGESTION NO. 2

KEYSTONE ASPHALT PRODUCTS CO.

CHICAGO, ILL. JAN. 15 '45. T.R.J.

PLAN No. 2 is designed for those engineers who prefer to use dummy joint as a contraction joint rather than Keystone's Tongue and Groove Center strip as suggested in Plan No. 1. In this alternate plan, Keystone Mastic Board Dummy Joint is used as a contraction joint to create the "plane of weakness". Keystone Tongue and Groove Joint is used for center strip.

When the plane of weakness type of joint is preferred by the engineering authorities, the Keystone method of installing permits these joints to be kept on the vertical and due to the rigidity of Keystone Mastic Board it eliminates the snaking action which occurs when non rigid flexible ribbon strips are used. The Keystone method also does away with the use of expensive installing machinery. Lower initial cost of material and labor, and the ease of handling are other factors influencing its adoption by contractors throughout the country.



If there's a call for a parachutist on the home front, steel rigger Lon Westfal should be well equipped with preliminary training. He's pictured here suspended in a "bosun's chair" from the tip of a 135-foot crane boom on a rubber-tired General Supercrane, repairing a 110-foot stack damaged in a storm.

Engineer Unit Fights And Builds in Italy

When the history of the Italian campaign is written with full attention to the factors contributing to its success, Army Engineer units such as the 39th Engineer Combat Regiment will receive the full public recognition they deserve. The 39th is more than a construction unit. It is a double-threat outfit which can do, and does, a turn as infantry as well as build bridges, repair roads, and perform all other normal engineer functions.

Currently the 39th Engineers are keeping open Highway 65, the route which serpentines through the Apennines between Florence and Bologna and which has suffered the ravages of both combat and winter's ice and snow. The task of keeping this highway open climaxes two years of front-line engineering and infantry service for the 39th Engineers. For their many accomplishments, they have won commendations from two armies, a corps, and three infantry divisions. Commanded by Colonel Thomas E. Green of Austin, Texas, the outfit has functioned as line infantrymen on three Mediterranean beachheads, in addition to their duties with bulldozers, picks and shovels.

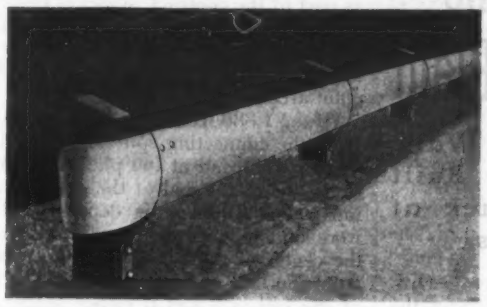
For several months after landing at Oran, Algeria, in January, 1943, the regiment fulfilled assignments in Algeria and Morocco. In July of that year, it received an infantry mission. The regiment's 1st Battalion landed with the Rangers on D-Day at Gela, Sicily, and soon was joined by the other two battalions. The regiment built ninety-seven by-passes and shoved rubble from seven towns during the 38-day campaign.

At Salerno, the 1st Battalion participated in the bitter beachhead fighting and subsequent action. The entire regiment joined the Fifth Army in time for the first crossing of the Volturno River. Assault boats carrying the attacking infantry were piloted across the river by the 39th Engineers who also built one of the first treadway bridges across this fire-swept swift-flowing stream. In the 1943 winter drive to Venafro and Mignano, the unit maintained a lively schedule of bridge building, mine sweeping, and opening of damaged routes abreast of the advancing Fifth Army infantrymen.

The regiment played an infantry role on the Anzio beachhead where it landed on January 24, 1944, and held the right flank along the Mussolini Canal until relieved. Reverting to engineer duties again, it strung 90 miles of concertina and planted a belt of 40,000 mines while the Krauts shelled and took pot shots at them from nearby positions. Bulldozers of the 39th helped to carve out new roads at the beachhead. One bulldozer operator thus engaged interrupted his work long enough to capture a patrol of seventeen Germans who crawled too close to the engineering project. Another of the unit's accomplishments at the beachhead was the construction of an 80-foot Bailey bridge across a canal in the "factory" area in seven hours, under withering enemy artillery, mortar, and small-arms fire.

After expediting the break-through from the beachhead with a rapidly built 8,000-yard valley road running to the Appian Way, men of the 39th pushed north of Rome along Route 1. Moving up to Florence, 39th troops threw a 410-foot Bailey bridge across the Arno while the Germans were still holding the northern half of the city. Built under shellfire in five days, this bridge is still in use.

The records kept by Major Grant K. Borg, Salt Lake City, Utah, regimental S-3, show that the 39th Engineers have to their credit, in Italy alone, 125 bridges, 77 by-passes, 123 culverts, 24 major road blocks, 7 airstrips, and a floating footbridge, along with approximately 450 Purple Hearts.



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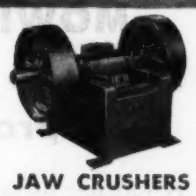

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Overhead eccentric type for primary crushing. Will handle large material, has downward and forward crushing action. Sturdy design for high tonnage capacity.

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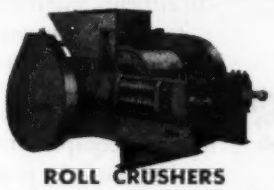

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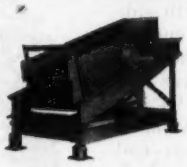

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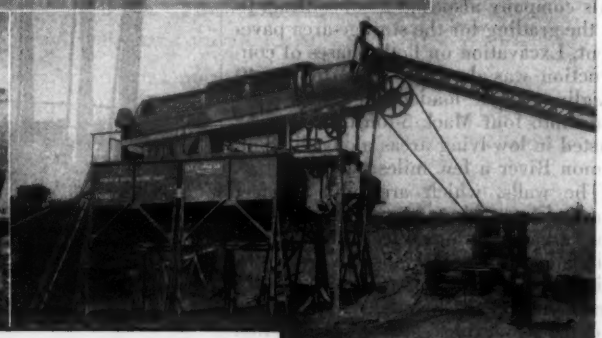
Portable or stationary types, adapted for scalping, washing, scrubbing and sizing, also for dehydrating. Available with spray pipes, conveyors, sand jacket, bins.

Portable Crushing Plants
Have primary and secondary crushers, screen and conveyor. Produce aggregate for road surfacing and other construction. Available in 5 sizes capacities to 300 t.p.h. Washing and dehydrating equipment optional



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Army Alterations At Ordnance Plant

Concrete Retaining Walls And Paving Dock Built For Depressed Track at Decatur, Illinois

✦ DURING 1944 the huge Victory Ordnance Plant at Decatur, Ill., was the scene of a major alteration, as the U. S. Corps of Engineers effected a changeover in production from the manufacture of light, air-cooled radial diesel tank engines to the heavier, water-cooled diesel engines for Caterpillar D7 tractors. Initial construction of this modern four-building plant covering 40 acres was begun in February, 1942, and the assembly line was turning out tank engines by the spring of 1943.

Conversion to the manufacture of tractor engines, which meant practically tearing out the insides of the buildings and reconstructing them, was started in January, 1944, and was finished by the end of September at a total cost of $1,766,305. As additional outdoor storage space was needed in the new set-up, 90,000 square yards of concrete paving was added to an existing storage area adjacent to the main building; 1,880 feet of track was laid to serve this area; and 1,400 linear feet of concrete retaining wall was constructed flanking the track on both sides for 700 feet.

The Victory Ordnance Plant is located on Illinois 121 about 1½ miles northwest of Decatur and has connections with the nearby rail systems of the Illinois Central and the Illinois Terminal Railroads. The main building, No. 103, manufacturing and assembly center, is 1,040 feet square, occupying nearly 25 acres. The original 105½-foot width of concrete pavement constructed for storage purposes on the north side of this building was not large enough to handle the new production schedules, so an additional concrete area was laid down which extends northward 94 feet from the edge of the existing pavement. This width increases at the eastern end as it follows the curve of a track, which takes off at grade from the classification yard at the northeast corner of the plant and gradually cuts below the surface of the ground until it becomes fully depressed as it follows a course 200 feet away from, and parallel to, the north wall of Building 103.

Retaining Walls

The first step in this outside construction was the building of two reinforced-concrete retaining walls and the laying of the spur track between them. This work was done by the Central Engineering & Construction Co., Indianapolis, Ind., with a direct contract from the War Department on its low bid of $47,026. This company also had a subcontract to do the grading for the storage-area pavement. Excavation on both phases of construction was done by a Northwest 40 dragline which loaded the black silty loam into four Mack 5-ton trucks, to be wasted in low-lying areas along the Sangamon River a few miles away.

The walls, which are built 20 feet apart face-to-face for their 700-foot length, have footings 6 feet wide x 1 foot 6 inches deep. Both walls have variable heights corresponding to the profile of the depressed track but average 9 feet, and are 1 foot thick, stepped back 1 foot from the toe of the footing. In back of the north wall is a parking lot for employees' cars, graded to within 9 inches of the top of the wall. The south wall has a 10-inch cantilevered slab at the top extending 12 feet 6 inches back from the face of the wall. Truck-mixed concrete from Decatur was used in the wall construction. The depressed section of track is drained to a low point or sump at the west end where a pump house was built as part of the contract. Water is pumped from this sump and carried 120 feet through a 24-inch concrete pipe culvert to a drainage ditch outside the fenced-in plant area.

Of the 1,880 feet of track which is laid from the connecting spur of the Illinois Central Railroad at the plant classification yard to the end of the dock retaining wall, 1,100 feet is depressed. Ties were laid on pit-run gravel ballast and the center of the track is 6 feet ½ inch from the face of the south wall. The top of the rail is 3 feet 6 inches below the top of the wall.

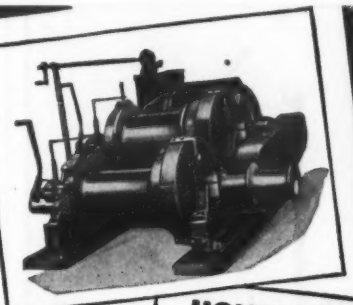
Major Quantities

The major quantities involved in this contract, which included the construction of the retaining walls, track, sump, and pump house, were:

Total excavation	9,160 cu. yds.
Track laying	1,880 lin. ft.
Ballast pit-run gravel	1,410 cu. yds.
Concrete for walls	800 cu. yds.

(*Concluded on next page*)

Hoists to Fit the Job



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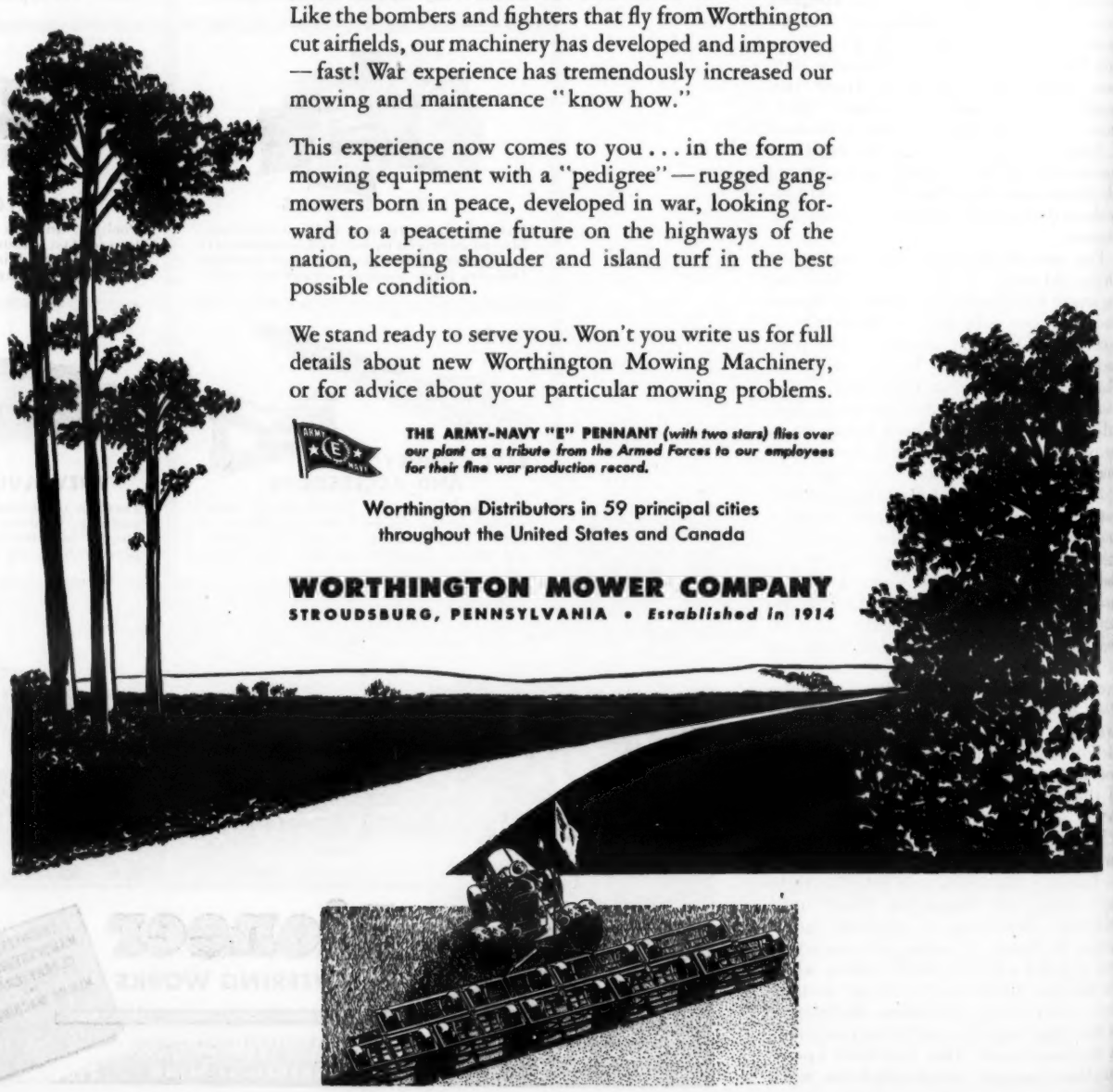
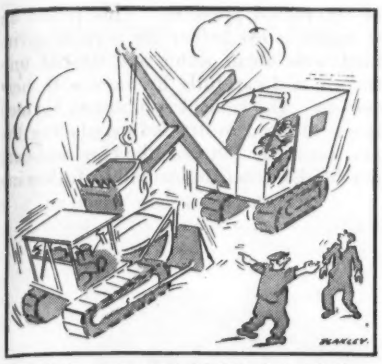




"Call the Boss quick! They're fighting again over which is doing the most to win the war—'dozers or shovels!"

Ordnance Plant

(*Continued from preceding page*)

J. E. Disher was Superintendent for the Central Engineering & Construction Co., which completed its work during March and April, 1944.

Paving Storage Area

The prime contractor for the conversion expansion program was the National Concrete Fireproofing Co. of Cleveland, Ohio. This company sublet the grading and paving of the storage area to the Thomas McQueen Co. of Chicago, Ill., for $41,707.50, which in turn sublet the grading and preparation of the subgrade to Central Engineering & Construction Co.

Excavation for wall and paving having been done in one continuous operation, the next step was to lay a 6-inch compacted layer of gravel within the following gradation:

Passing	Per Cent
3-inch sieve	100
No. 10 sieve	40-100
No. 40 sieve	10-70
No. 200 sieve	0-5

The pervious gravel was compacted by a double-drum sheepsfoot roller pulled by a Caterpillar tractor and was followed by a 5-ton 3-wheel roller. The area to be paved partly circled a substation near the northeast corner of the main building and continued west for 665 feet with a minimum width of 94 feet which was increased at the eastern end as the pavement was extended to follow the line of the railroad.

The contractor set up Blaw-Knox batchers for cement and aggregate, and used a Koehring 34-E paver for mixing a 6-bag batch of 1:2½:4½ concrete which developed in the 7-inch plain-concrete slab flexural strength of 650 pounds per square inch after 28 days. Finishing was done by a Blaw-Knox finisher.

A 25-foot strip adjoining the cantilever slab of the retaining wall was paved first. At the north end, this strip was 10 inches deep to correspond with the thickness of the wall slab from which it was separated by a 1-inch premoulded expansion joint. The pavement then tapered back in 4 feet to a uniform 7-inch depth. Two more 25-foot strips, followed by a 19-foot strip, were paved for a length of 640 feet, with expansion joints at 100, 120, 120, 120, 100, and 80-foot intervals. Another expansion joint was placed longitudinally between the original concrete pavement and the newly laid sections. Transverse dummy joints were spaced 20 feet apart. After the straight runs of concreting were completed, the irregular-shaped sections at the east end of the storage area were paved. Aquastatic compound was used in curing the concrete.

This contract was completed in May and June, 1944, with P. W. Joy as Superintendent for the Thomas McQueen Co., contractor.

Personnel

These alterations at the Victory Ordnance Plant in Decatur, Ill., were under the direction of Colonel H. J. Woodbury, District Engineer, U. S. Corps of Engineers, Chicago, Ill., and Colonel H. A. Montgomery, Division Engineer, Great Lakes Division, with headquarters in Chicago. Captain W. L. Lange was Area Engineer. Bevington, Taggart & Fowler, Inc., of Indianapolis, Ind., were consulting engineers on this reconversion project, with C. W. Taggart, Architect-Engineer-Manager.

New Mack N. E. Manager

P. J. Degnon, Vice President of the Mack Motor Truck Co., New York City, has been made Manager of the company's New England Division, with headquarters in Boston. In this post he succeeds W. A. Maynard, who has retired. Mr. Degnon has been with the Mack organization since 1919, starting as Branch Manager at Atlanta, Ga. Later he was made Manager of the Southern Division and in 1925 was appointed Vice President in charge of sales and service in the south. In 1933 he was transferred to New York as Manager for the metropolitan area.

A Research Report On E. P. Lubricants

A 67-page report "Extreme Pressure Lubricants" has recently been completed and published as Research Report No. 1, GR No. 25, by the Engineering Research Division, Mack Mfg. Corp., Plainfield, N. J. The research on which this report is predicated studied lubricant resistance to film rupture and metallic surface fusion under high pressure, and sliding friction which requires a lubricant possessing a combination of high film strength, oiliness, heat stability, and anti-weld properties. In the development of its automotive products, Mack Mfg. Corp. felt that such a study should be made and designated Clark A. Rodman, Research Chemist, under Walter M. Mitchell, Director of Research, to make the study and present the report.

There is much in this report of interest to users of hypoid gears. Only a few copies of the report are available for general distribution but equipment superintendents of highway and contracting organizations may secure copies by writing on their business letterhead to Engineering Research Division, Mack Mfg. Corp., Plainfield, N. J., and referring to this review.

Heavy-Duty Welders For Garage Service

Several models of portable electric welders for use wherever alternating current is available are listed in the new folders of Glenn-Roberts Co., 3100 East Tenth St., Oakland 1, Calif. These shop or garage welders can be used for building up worn spots on moldboards, can weld frames and braces, hard-surface or build scrapers, repair disk harrows, build up pump shafts, and do any one of the limitless number of repair jobs which any highway or contractor's shop or garage is called upon to do today.

Copies of these bulletins will be supplied promptly by the manufacturer to readers of CONTRACTORS AND ENGINEERS MONTHLY.

• To offset the effects of an off-center load . . . to keep the load pushing straight ahead, without whipping or jerking, Oliver "Cletrac" offers you *controlled differential steering.*

On an Oliver "Cletrac" tractor, the pull of one track is balanced against the pull of the other. The relative speeds of the tracks may be changed to offset the side pull of an off-center load. Power is never completely disconnected from either track at any time . . . *even on turns.*

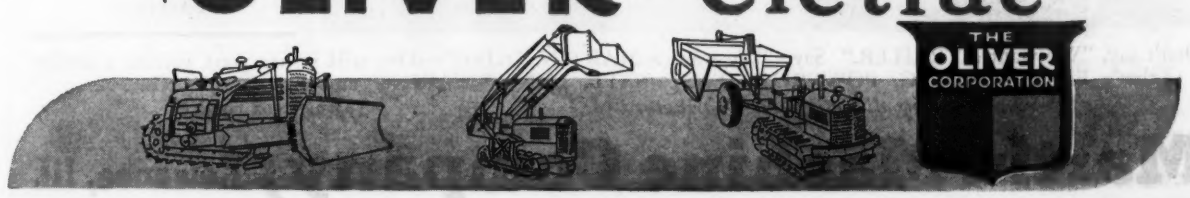
Bulldozing, trailbuilding or grading, the *controlled differential steering* of Oliver "Cletrac" tractors means added safety. They are always under perfect control . . . on hills or levels. And they steer the same going downhill or up! There's no need to "declutch" or "brake" when turning.

Ruggedly built for long, dependable service, Oliver "Cletrac" tractors are designed to withstand the shocks, strains and twists of construction service. Their unusual accessibility makes maintenance a simple task.

Substantial numbers of Oliver "Cletracs" are now being released for essential use. Your Oliver "Cletrac" dealer will gladly assist you in making application for a new tractor.

The OLIVER Corporation, Industrial Division: 19300 Euclid Avenue, Cleveland, Ohio.

OLIVER - Cletrac



N. J. Uses Concrete For Shallow Patches

Success of First Shallow Patches Eighteen Years Ago Leads to Present Standardized Patching Procedure

✦ SHALLOW failures in cement-concrete pavements are due, in many cases, to the burning of oil trucks and other motor vehicles within the paved roadway width and, in some instances, to the unwise use of concentrated forms of chemical in ice control. Where such failures have not progressed to too great a depth, it has been found economically sound and generally structurally successful in New Jersey to replace such areas with shallow patches.

An interesting report on the original work of this nature 18 years ago has been made by Fred D. Woodruff, Assistant Superintendent of Maintenance, New Jersey State Highway Department, together with a statement of the standard procedure which has developed from the earlier experiments. The original replacement, 18 years ago, was on N. J. 4 at a point where the burning of a gasoline tank truck had caused the calcination of the concrete surface to a maximum depth of approximately 1½ inches. In this original operation, all damaged concrete was removed down to a sound clean surface. The perimeter of the area to be restored was hand-chiseled to a vertical edge, the surface thoroughly cleaned by wire brushing, and a solution of calcium chloride applied directly to the concrete.

In this highly experimental replacement a very rich mixture of 1:1:2 concrete was used. The coarse aggregate consisted of ¼-inch to ⅜-inch broken stone or pea gravel. In this 4-gallon water-cement-ratio concrete was a solution of about 2½ per cent calcium chloride, the commercial chemical containing 75 per cent of the pure anhydrous salt. Immediately following the application of the calcium-chloride solution, the exceedingly dry concrete, which had been mixed by hand and allowed to approach initial set, was placed in the patch area, thoroughly tamped, and struck off roughly somewhat above the ultimate finished grade.

About 15 minutes after initial set, the mixture was retamped thoroughly, screeded and planed to the proper section, finished and broomed strongly. Curing was done with damp earth moistened at proper intervals for a period of 10 to 12 days. Fortunately, the highway, at the site of this repair, did not carry heavy traffic; otherwise the closing of one traffic lane on a two-lane highway for such a period would have been highly questionable, and today would be considered entirely inadvisable.

After 18 years, this shallow patch has shown no marked indication of failure. In some few spots slight spalling has occurred, due, in all probability, to non-uniform distribution of the aggregate resulting from hand-mixing methods. From this small beginning, there evolved a number of improvements although it cannot be said that these later developments were productive of any better results.

Recent Patches

Where shallow failures in pavement surfaces have occurred in recent years, it is the practice of the New Jersey State Highway Department to remove all unsound concrete to a depth of not less than 1 inch and, as nearly as possible, to secure a uniform thickness in the patch. The sides are finished with pneumatic or hand tools to a vertical edge.

Sound concrete having been exposed, the area to be repaired is carefully cleaned with a blast of compressed air at 100-pound pressure. This jet of air is applied just before the area is sprinkled with clean water and dusted uniformly and carefully by hand with neat cement. The cement solution so formed is not allowed to dry before placing the new concrete. In case the concrete cannot be deposited immediately following

(*Concluded on next page*)

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To meet the demand that will exist for proven equipment, MARION has a machine of the right size and type from ¾ cubic yard to 35 cubic yards.
Put a fast, powerful MARION on that postwar job—then watch the rock and dirt fly!
Let's discuss your problems!
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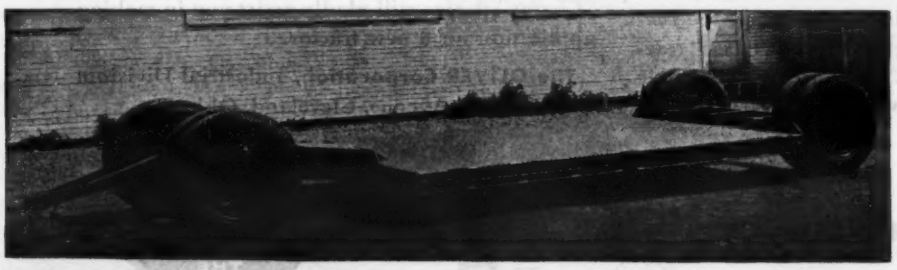
CLAMSHELLS • WALKERS • from 3/4 cu. yd. to 35 cu. yds.



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—4 models—
7, 10, 15 & 20-ton capacities

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Shallow Patches

(*Continued from preceding page*)

the air-blast cleaning, this operation is repeated before sprinkling and dusting with the neat cement.

The following proportions and materials are generally used, although atmospheric conditions and other unpredictable circumstances may cause variation in the procedure, and the skilled supervisory personnel must remain the sole judge of the exact methods to be adopted. Calcium chloride is used at the discretion of the Maintenance Supervisor.

Coarse Aggregate	Proportions	Depth
Coarse sand to ¼-inch gravel or broken stone	1:1:2	½ to 1½ inches
¼ to ¾-inch broken stone or gravel	1:1½:2½ 1:1¾:3	1½ to 4 inches
**1½-inch broken stone or gravel *¾-inch broken stone or gravel	1:1¾:3	Over 4 inches

**Two parts *One part

The deposited concrete, preferably mixed by machine, with a water-cement ratio not exceeding 4 gallons, is thoroughly tamped and roughly screeded slightly high. Then following the initial set and after one to two hours, depending on atmospheric conditions, wind, and the setting characteristics of the cement, it is retamped, planed, finished, and broomed.

In some cases, where patches of ½ inch or less are undertaken, the surface of the repair area is washed with hydrochloric acid, following which, and just before the concrete is deposited, the surface receives an application of sodium metasilicate.

In the deeper patches, and always where full-depth work is undertaken, a mechanical vibrator is used further to insure the density of the completed patch. Wherever possible, in order that the color of the surrounding pavement may be matched, selected materials which will produce non-contrasting colors are used, and, in some cases, where the surface has become badly darkened, an admixture of ferrous oxide or lampblack is employed. Wherever possible, a standard brand of high-early-strength cement is used, but where it is not obtainable, the proper solution of calcium chloride is added to the water and extra cement used in the mix.

Burlap covers and water, frequently applied, are used for curing, although dampened earth cover has been employed successfully.

Shallow patches are sometimes opened for traffic in 36 hours with no apparent detrimental results. Deeper patches are kept traffic-free for longer periods.

A striking example of shallow concrete patch work is located on N. J. S28 in the vicinity of Tanners Corner where a gasoline tank truck overturned and burned. After more than two years, this patch is 80 per cent satisfactory, only the very shallow portions having scaled.

Mr. Woodruff gives the following seven essential requirements for successful concrete patching, either shallow or full depth:

1. Clean and sound concrete surfaces.
2. Nicely controlled aggregates.
3. Extremely dry, uniformly mixed replacement concrete.
4. Thorough wetting of old concrete.
5. Final tamping and finishing after initial set to prevent contraction and separation of new and old concrete.
6. Careful curing.
7. Well trained and skilled workmen for all operations.

Joins Wyandotte Staff

F. R. Sproule has recently joined the staff of the Wyandotte Chemicals Corp., Wyandotte, Mich., as a technical advisor on the use of calcium chloride for dust control, consolidation of gravel bases and surfaces, frost control, concrete curing, and for other construction uses. Mr. Sproule has had considerable experience with soil stabilization, both in laboratory research and field construction, and spent twelve years in the development and promotion of materials for highway construction. He was formerly in the employ of the American Bitumuls Co. and the Col-Tex Refining Co.

Chain Belt Appoints Knoxville Distributor

The appointment of the Martin Machinery & Supply Co., 700 Dale Ave., Knoxville, Tenn., as distributor of the complete line of Rex construction machinery in the surrounding territory has recently been announced by the Chain Belt Co. of Milwaukee, Wis.

Karl R. Martin is head of the Martin organization, and associated with him are John Hay, L. C. Biggs, Houston Brown, and Karl R. Martin, Sr.

The Rex line which Martin will distribute includes concrete mixers, plaster mixers, pumps, Moto-Mixers, pavers, and Pumpcretes.

For Speedy heating of tar and asphalt—

Use this CONNERY oil-burning Patrol Patching Heater on the *small* job and this CONNERY oil-burning kettle for *large-quantity* production.

Write for catalog showing our full line of tar and asphalt heating kettles, spraying attachments, pouring pots, etc.

Connery Construction Co.

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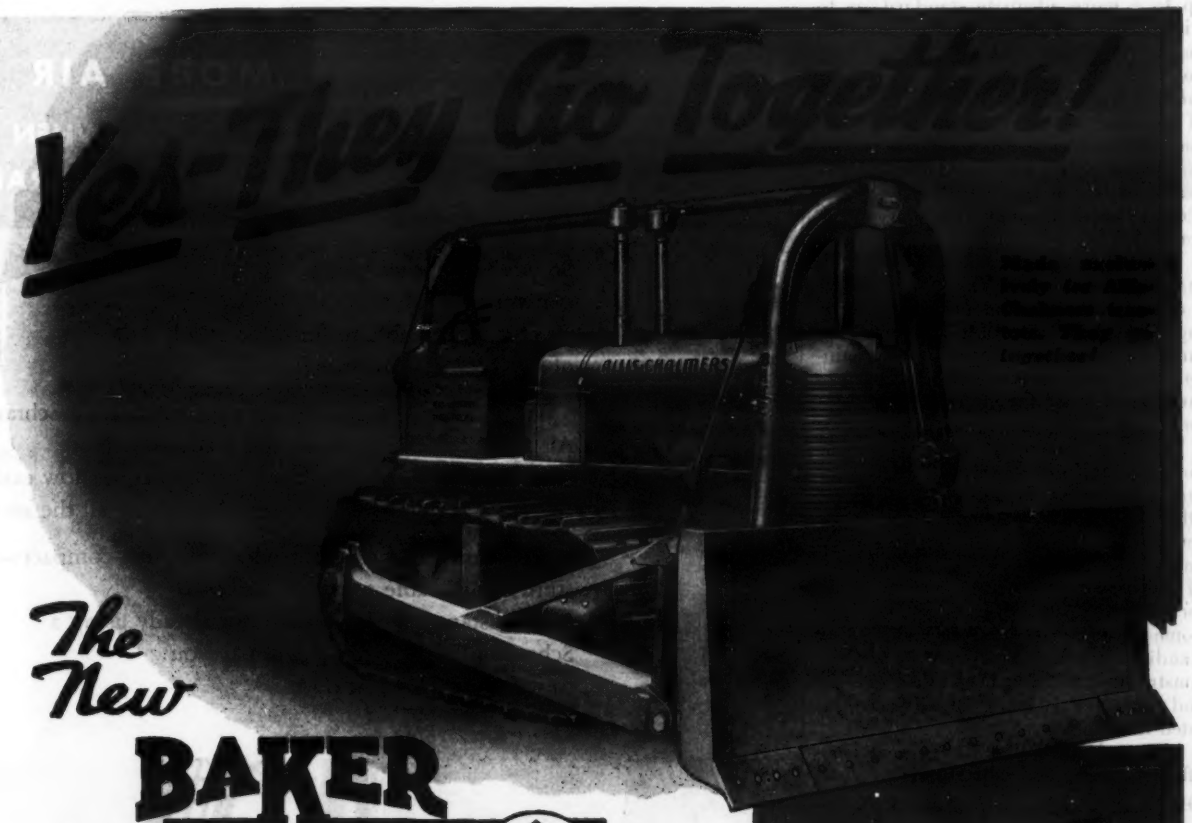
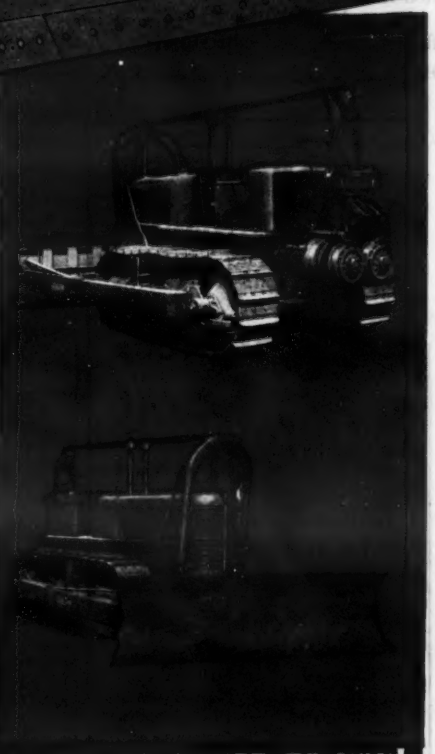


The New

BAKER

Cable Controlled Bulldozer and Gradebuilder and Allis-Chalmers Tractors



Baker, the greatest name in Hydraulic Bulldozers, announces the *new* Baker Line of Cable Controlled Bulldozers and Gradebuilders. Designed with the full cooperation of Allis-Chalmers and Baker engineers and thoroughly tried and field tested under their joint supervision, here's more evidence that Baker Equipment and Allis-Chalmers Tractors *"go together."*

Features include • 5-position tilting blade on both bulldozers and gradebuilders • "Air-conditioned" cone clutches and differential or self-energizing brakes with all adjustments within easy reach • Rugged tubular steel superstructure • Double and single drum power control units for use on rear, and single drum for use on front power take-off. Available as separate units • Simple to operate and maintain, sturdy construction, well-balanced, minimum weight. Send for literature.

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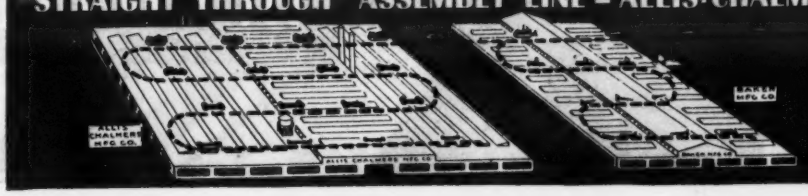

The modern Baker plant with its completely equipped fabricating, machining and blacksmithing shops adjoins the Allis-Chalmers crawler tractor plant. When you order an A-C tractor with Baker bulldozer or gradebuilder, your tractor leaves the A-C assembly line, crosses a narrow court and goes on the Baker final assembly line.

A Wartime Clean-Up For Post-War Work

Construction Contracts in Indiana Now Include Repair Of Flood Damage As Well As Resurfacing and Widening

By EARL W. CASSADY, District Engineer, State Highway Commission of Indiana, Vincennes, Indiana

✦ IN order to maintain the traffic facilities of Indiana for vital wartime service, the State Highway Commission of Indiana has, for the past two years, carried out a comprehensive program of maintenance projects. These have been let as maintenance-construction contracts, and have included both concrete widening and patching and bituminous resurfacing and widening. This program has proved to be very timely in preserving failing sections of road surface, and in bringing up to a more adequate standard, as to width, the narrow sections constructed many years ago. This expedient has done a great deal to insure satisfactory through-traffic facilities for the duration of the war emergency. There still remained, however, even with this program and a full-scale resurfacing program for secondary roads, much to be accomplished through auxiliary contracts.

It became apparent, early in 1944, that there was in the Vincennes District a considerable amount of work requiring immediate attention that was too large in scope to be handled by maintenance force-account methods, particularly in view of the shortage of equipment and skilled personnel.

This work consisted of the repair of flood damage around several large structures, protective measures necessary at other structures, channel clearance by removing timber and by dredging, elimination of unsafe structures, correction of unsafe sections in rock cuts, and relocation of roadways in slide areas. Some of these were problems of long standing, but in the press of pre-war construction had not been taken care of and consequently had gradually accumulated in number.

It was decided that the present time offered a very good opportunity to clean up the "back yard" before the post-war construction program was started. This was due to the assumption that contractors and equipment for this type of work would be available at the present time, and that contractors would be glad to have such "clean up" jobs available on which to bid. The investigations and recommendations of these various projects were made in a routine manner, and the majority of the projects were prepared for letting early last summer. Our belief in the interest in this type of work was justified as all of the contracts advertised were let.

Protecting Bridges

Five of these projects were at the site of state highway bridges, all large multi-span steel trusses over the west fork of the White River, always troublesome in flood time. The largest contract was for extensive dumped riprap to protect the west pier and abutment footings of the Elnora Bridge on Indiana 58 over the White River, and the north bank of the stream for several hundred feet to prevent further encroachment and flood damage to the approach. The stream had cut the west bank to such an extent that the west abutment was in line with the east bank of the stream north of the structure. To alleviate such conditions, a channel was excavated at approxi-

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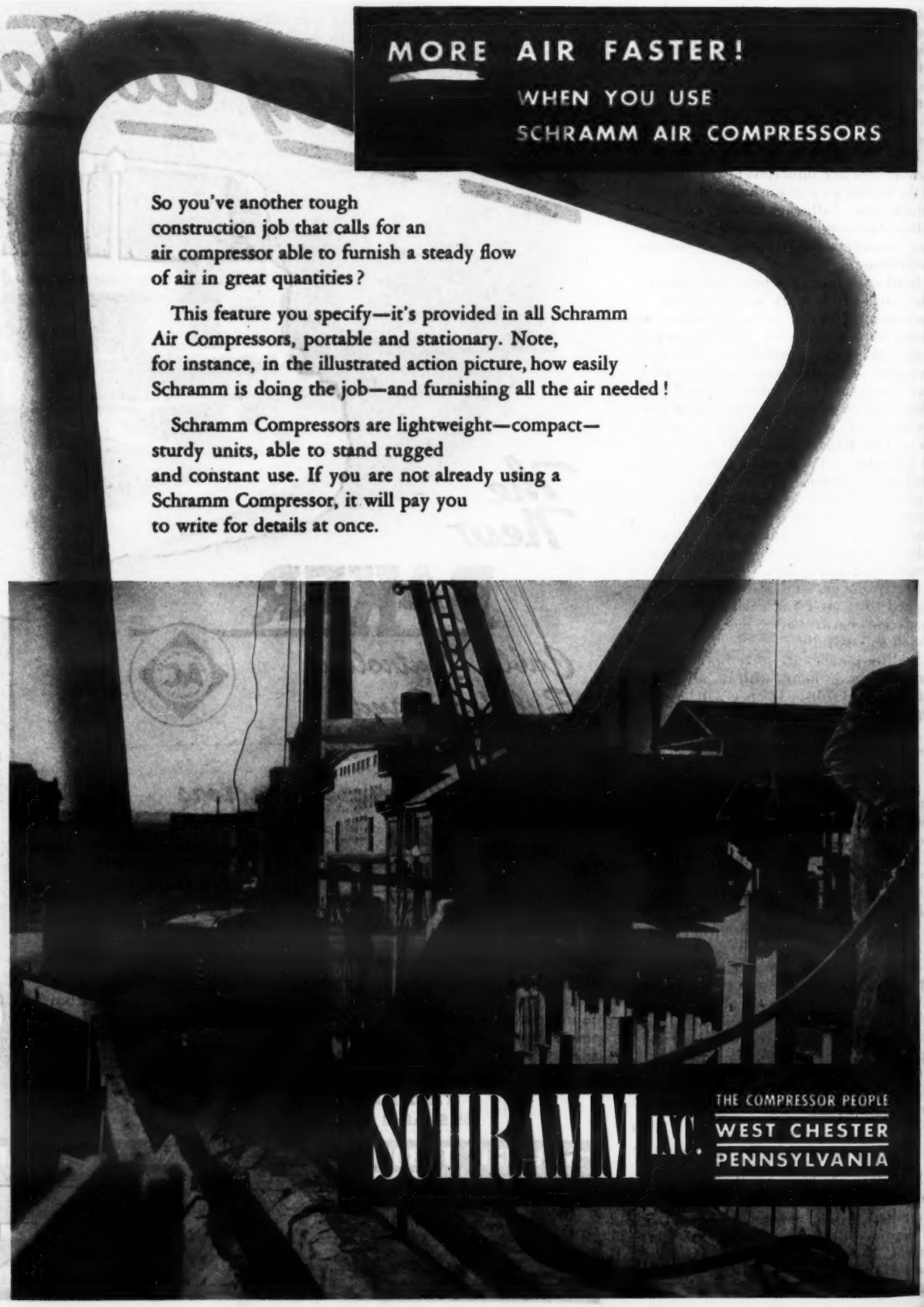
The Vincennes District of the Indiana State Highway Commission has awarded a number of contracts to correct erosion at bridge piers and abutments by backfilling and dumped riprap.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WHEN YOU USE
SCHRAMM AIR COMPRESSORS
So you've another tough construction job that calls for an air compressor able to furnish a steady flow of air in great quantities?
This feature you specify—it's provided in all Schramm Air Compressors, portable and stationary. Note, for instance, in the illustrated action picture, how easily Schramm is doing the job—and furnishing all the air needed!
Schramm Compressors are lightweight—compact—sturdy units, able to stand rugged and constant use. If you are not already using a Schramm Compressor, it will pay you to write for details at once.
SCHRAMM INC.
THE COMPRESSOR PEOPLE
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Detroit	San Francisco
Indianapolis	St. Louis

CONTINENTAL
RUBBER WORKS
ERIE PENNSYLVANIA U.S.A.

A deep vertical cut in soft sandstone on Indiana 50 is being terraced as shown as a safety measure to eliminate falling rocks.

Wartime Clean-Up

(*Continued from preceding page*)

mately the site of the former channel. This earth work was done after clearing away a heavy stand of timber. It is believed that this will tend to correct a very difficult situation.

At other structures, flood channel areas were cleared of undergrowth and timber to reduce the pressure and backing up of flood water at such locations. Also, areas where previous floods had caused considerable wash in the vicinity of piers and abutments were corrected by extensive backfilling and dumping of riprap to prevent further damage.

A long fill on Indiana 61 between the main structure over the White River and the overflow structure, located downstream from the junction of the east and west forks of the White River, was investigated and recommended for cast concrete-block riprap on the downstream slope where extensive damage occurred annually from wave action during high water. This riprap was also felt to be an additional safety factor to prevent the possible loss of the fill if a maximum flood should be encountered simultaneously on both streams, and the water should rise at this location to the extent that it would flow over the fill. Mulched seeding and planting were specified for the upstream slope in view of the considerable amount of sod and trees to be found there.

Other Work

A very obsolete and unsound wooden grade-separation structure over an abandoned spur of the Monon Railroad at Bedford on Indiana 58 was replaced by an earth fill and concrete pipe culvert. A very deep vertical rock cut in soft sandstone on Indiana 50, which has been growing increasingly hazardous due to weathering, is being terraced back. This is in line with the general improvement of this highway which is on the interregional system.

More Contracts Coming

Other plans are in the process of design, and it is anticipated that they will be prepared for letting within a few months. It is evident that the auxiliary program has proved to be very beneficial in the cleaning up of many small projects, and at such a time as they can be easily contracted. All work of this type, of course, helps to clear the decks for the expected large construction program to follow in the post-war era.

Myers Joins Washington Staff of Cooper-Bessemer

Walter F. Myers has been appointed to the Washington, D. C., staff of the Cooper-Bessemer Corp., manufacturer of diesel engines and compressors, Mount Vernon, Ohio. In his new position Mr. Myers will assist Charles G. Cooper, Director of the Washington office, in handling and supervising government contracts, and in sales and service in the South Atlantic states. Mr. Myers' experience in this field covers twenty-five years of service as sales engineer, construction engineer, and consulting engineer for a number of organizations including Fairbanks, Morse & Co., the Federal Power Commission, and the U. S. Maritime Commission.

Two Bills to Assure Delaware R. Crossing

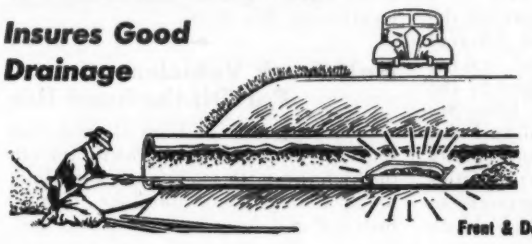
Two bills have been introduced in the Delaware Legislature to make possible the construction of a vehicular crossing, either a bridge or a tunnel, of the Delaware River as a Delaware state project, at an estimated cost of $20,000,000. One of the measures, the enabling act, provides that the State Highway Department be authorized to undertake the construction of a crossing of the river in the vicinity of Pigeon and Deepwater Points.

The bill would empower the Department to engage engineers, acquire property, including the purchase of the present ferry service, and to let contracts for the construction of a crossing and subsequently to maintain the structure and operate it as a part of the state highway system.

The second bill would authorize the Department to issue bonds up to $25,000,000 which would be secured by tolls collected from those using the crossing. These bonds, the bill states specifically, would not carry any guarantee of the State of Delaware and would be sold to private investors. When the revenue from the crossing had paid off such bonds as were issued for the project, the Highway Department would be authorized to reduce the toll to a nominal fee only sufficient to maintain the structure, or declare the structure a free one, as circumstances might dictate at the time.

MORCO CULVERT CLEANER

Insures Good Drainage



Restore clogged culvert pipes to service with the "Morco" Culvert Cleaner. Quick-acting, non-damaging, easy operating "Morco" is the most satisfactory tool yet developed for this work.

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SHOVEL DIPPERS
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1. FULL LENGTH, ONE-PIECE, 14% MANGANESE STEEL FRONTS AND BOTTOMS that develop tensile strengths up to 140,000 lbs.
2. WIDE SET CORNER TEETH break up material, leaving only scooping up function for lip to perform.
3. MANGANESE STEEL TEETH ARE REVERSIBLE AND TAPERED SOCKET TYPE kept tight by digging pressure, but easily removed by light tapping from behind.
4. CURVED BACKS ASSURE FULL LOADS by eliminating hard-to-fill corners.
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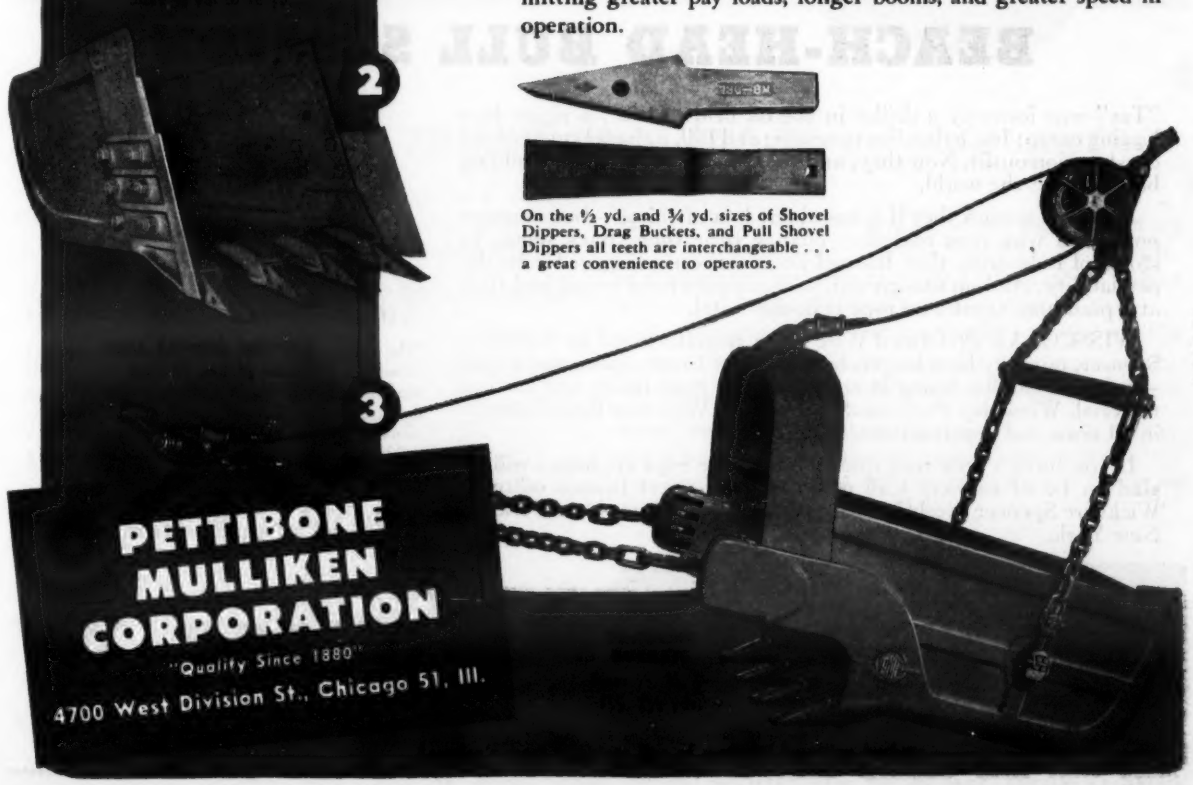
On the ½ yd. and ¾ yd. sizes of Shovel Dippers, Drag Buckets, and Pull Shovel Dippers all teeth are interchangeable . . . a great convenience to operators.



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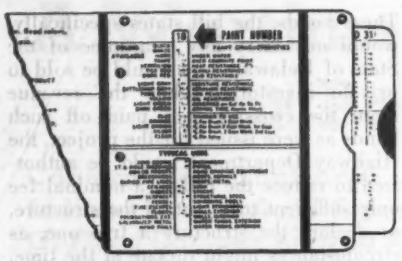

A section of the new Valdura Painting Guide in handy slide-rule form.

How Do You Select The Paints You Use?

The selection of the best paint for a given application is a job requiring detailed technical knowledge of different finishes. A handy method of making this selection has been developed by the American-Marietta Co., 43 E. Ohio St., Chicago, Ill., through its Valdura Paint Guide. This Guide makes conveniently available all information on properties of, and all application data necessary to choose properly from, the entire Valdura line of heavy-duty maintenance paints.

The Guide is in the form of a slide rule of convenient pocket size and, with only two settings, gives the correct surface preparation and the proper priming and finishing coats. It also contains information as to the resistance of the recommended material to heat, acid, alkali, moisture, abrasion, sun, and oil, as well as coverage and drying time. It further shows the proper thinner to use as well as the correct proportion.

These 4 x 8¼-inch Guides may be secured without charge by readers of CONTRACTORS AND ENGINEERS MONTHLY in the management and maintenance fields direct from the manufacturer by mentioning this item.

Half-Track Vehicles For Off-the-Road Use

Several models of Linn Haftrak and Catruk vehicles, designed chiefly for off-the-highway earth moving, rock hauling, tough snow-plowing jobs, etc., are illustrated and described in a 6-page bulletin just received from The Linn Mfg. Corp., Morris, N. Y. The Haftrak resembles a conventional truck except that propulsion is through tracks which take the place of rear wheels and supply traction over terrain where a wheeled vehicle would be impractical. Various types of bodies are shown, including a side-tipping dump body, a laminated steel and wood dump body with open cab, and with snow-plow mounting. The Catruck is equipped with four wheels and also with tracks in the rear, permitting operation as a truck or half-track, according to ground conditions.

A number of models of both vehicles are available for moving loads from 5 to 50 tons, and may be had with either 4 or 5-speed transmissions and with either gasoline or diesel engines. Complete specifications are included in the bulletin.

Copies of this bulletin, which has been printed in English, Spanish, and Portuguese, will be sent upon request to the company. Just mention this publication.

BEACH-HEAD BULL SESSION

"Tex" was formerly a driller in the oil fields; Oscar, a rigger in a logging camp; Joe, a dragline operator; and Bill, a shovel runner for a construction outfit. Now they, and thousands like them, are building bases 'round the world.

In a bull session they'll gripe about lots of things—but mention *pre*formed wire rope and they change their tune. Back home, in scores of industries, they learned an affectionate respect for its dependability. And on foreign soil, with supplies hard to get and time at a premium, stout wire rope is doubly vital.

WISSCOLAY *Pre*formed Wire Rope, manufactured by Wickwire Spencer, not only lasts longer, but it's easier to cut, splice and install —safer to handle. Using it saves money, man hours and critical material. Wisscolay *Pre*formed, like regular Wickwire Rope, is made in all sizes and constructions.

If you have a wire rope question our wire rope engineers will be glad to be of service. Call or write our nearest branch office or Wickwire Spencer Steel Company, 500 Fifth Avenue, New York 18, New York.

WHICH ATTACHMENT IS BEST?

The proper types of attachments and applications are two of the many useful ideas you'll find in "Know Your Ropes." This 82-page book contains 78 "right and wrong" illustrations, 40 wire rope life savers, 20 diagrams, tables, graphs and charts. It can help make your present wire rope last longer.

SEND FOR YOUR FREE COPY TODAY

Send your wire rope questions to:

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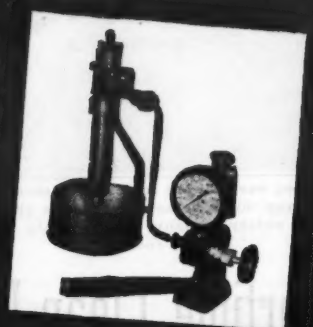
Keeps Diesel Engines Running Efficiently



TESTS FUEL INJECTORS AND HYDRAULIC DEVICES At Pressures Up To 10,000 p.s.i.

To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

Light in weight yet built for heavy-duty service, it enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p.s.i. Prevents costly delays and possible damage to engine.

Ideal for testing hydraulic devices.

Write for bulletin on this practical, low-cost unit.

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C. & E. M. Photo

The completed N. Y. Central bridge over the Detroit Industrial Expressway is 156 feet between abutments and carries eight tracks.

Railroad Bridge

(*Continued from page 26*)

of a double plate welded at the center, two angles, and a cover plate; and weighs 13 tons. Each fascia girder helps to support a ⅜-inch sloping baffle or ballast plate which ties in to the adjoining regular girder. The inside girders consist of a single web, two filler plates, two outside plates, four angles, and one flange plate on the bottom. Each girder weighs 25 tons.

The girders are fixed at the center pier but are on rockers at the abutments. There are seventeen girders from the center line of the bridge to the fascia girder, making a total of thirty-four across the bridge for each span from abutment to center pier. These thirty-four girders are divided into ten sets of triple-joined girders and two sets of double-joined girders. A triple set with diaphragm and floor plates weighs 75 tons. To save time in the field, the girders were joined together in the shop by assembling and riveting and brought from the Rankin, Pa., plant of the Bethlehem Steel Co. on two flat cars. The cars were brought to the side of the bridge on a temporary wooden trestle which was built sufficiently high so that the top of the flat car was at a level with the bridge seat. The rails of the trestle were just 4 feet below the bridge seat.

The girders were raised by four 75-ton Norton hydraulic jacks, two on each end, and placed on rollers. A cable was made fast to the center of the girder and it was pulled into position by a Caterpillar RD4 tractor. Very little pull was necessary to move the girders along on the rollers. When the desired position over the bridge seat was reached, the jacks were again used on a jacking bent to release the rollers and lower the girder onto the rockers. Two additional 50-ton Norton hydraulic jacks were used on the triple girders. The intermediate deck plates were then riveted in place. Twenty plates, 77 feet long x 3 feet 3 inches wide x ¾ inch thick, had to be riveted in the field, using air from Davey and Chicago-Pneumatic portable compressors.

A false girder was created down the center of the bridge by the erection of sloping side plates which are capped with a flat cover plate with angles on the sides. The side plates were not fixed to the cover plate but were left free for expansion or contraction. Welding of the side plates to the adjacent girders was done by a Lincoln 400-ampere portable welder.

Waterproofing the Deck

The deck of the structure consists of 21,500 square feet of steel plate covering the girders, and was waterproofed with a membrane covering. This consisted of a priming coat of RC-2 asphalt with a viscosity of 100 to 200 at 60 degrees C applied at a temperature of 350 degrees F at the rate of 4½ gallons to each 100 square feet of surface. The prime was allowed to dry and covered with two layers of bitumen-treated cotton fabric. This fabric was then given a mopping with the hot asphalt. The process was repeated until six layers of fabric and moppings had been given to the end sections where the trains pass onto the bridge, and a quadruple layer had been applied to the center of the bridge.

The membrane waterproof mopping in turn is protected by a 4-inch slab of concrete so that the ballast will not cut the fabric and thus permit moisture to get at the steel deck plates. This concrete protective coat was a 1:3 mix resembling grout and using only fine aggregate and was mixed in a Jaeger 3½-S unit.

Drainage

This 4-inch concrete slab is warped down to a 3-inch thickness at intervals of 13 feet across the bridge to create a drain for each track. An inverted 8-inch-diameter semi-circular cast-iron perforated drain was placed over these gulleys for the length of the bridge, thus affording drainage between each track.

The perforated pipes drain into an 8-inch square trough at the ends of the bridge between the abutments and the tie piers. The troughs conduct the water off the bridge into the side drains along

(*Concluded on next page*)

"I'm not your milkman...*but here's your milk*"

"I'm a Dodge service mechanic . . . not your milkman. So I can't promise to keep milk on your doorstep.

"I can help, though, because it's my *indispensable* job to keep milk trucks *going*.

"It's my job, too, to keep a lot of other trucks on the road . . . fuel trucks, farm trucks, food trucks . . . and especially trucks that haul war materials.

"All during the war, the Dodge factory has kept us well supplied with truck parts. And if you don't think parts are important, just ask truck owners. They know.

"We're awful busy, but my boss, the Dodge dealer, is a pretty level-headed guy and he says, 'Trucks come first, but don't let *anybody* down.'

"Well—that's right, because if we don't keep the home trucks rolling, it'll be too bad!"

Yes—your Dodge dealer and his service organization are on the job, doing a job. Whether you own a Dodge truck, or a Dodge or Plymouth car, your Dodge dealer's looking out for you—with the right factory-engineered parts . . . with time-saving tools and equipment . . . and a lot of Dodge "know how." See him for courteous service.
DODGE DIVISION, CHRYSLER CORPORATION

NEW TRUCKS AVAILABLE—Dodge is building new 1½ and 2-ton trucks, in limited quantities, for essential use. See your Dodge dealer for the right Job-Rated truck to fit your job—save you money!

DODGE *Job Rated* TRUCKS
FIT THE JOB . . . LAST LONGER

TUNE IN MAJOR BOWES, CBS, THURSDAY, 9 P.M., E. W. T.

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Hayward makes all three—clamshell, electric motor, orange peel. A Hayward recommendation is unbiased.

—HAYCO—

THE HAYWARD CO., 32-36 Dey St., New York

Hayward Buckets

Railroad Bridge

(*Continued from preceding page*)

the Expressway pavement.

An 8-inch layer of ballast was then placed over the perforated drains to carry the ties and rails. The tracks are placed on 13-foot centers except on each side of the false center girder where they are 20 feet on centers. A 2-foot railing of 3-inch pipe was placed on top of the fascia girders as a final touch to the bridge.

Beneath the bridge, the Expressway has two 24-foot concrete pavements separated by the center bridge pier. The pavement is 8 inches thick at the pier, increasing to 8½ inches in 6 feet, remains 8½ inches uniform thickness for 6 feet to the center joint, from which it is reduced uniformly to 6 inches at the outer edge of the pavement. A 6-inch vitrified-tile drain with open joints runs down the middle of each pavement just below the 2-foot concrete mat tying the abutments and the center pier of the bridge. The sewer is surrounded by porous material. A 24-inch reinforced-concrete culvert passes under the north lane of the Expressway.

Major Quantities

The major quantities involved in the construction of this bridge were as follows:

Item	Amount
Excavation	89,489 cu. yds.
Drainage pipe, 6 to 24-inch	3,194 lin. ft.
Catch basins	12
Manholes	5
Steel reinforcing	375,250 lbs.
Structural steel	3,604,041 lbs.
Concrete for substructures	6,118 cu. yds.

Personnel

This $741,216.13 grade-separation contract was awarded to W. J. Meagher & Sons, Bay City, Mich., by the Michigan State Highway Department. Fred Green was Superintendent for the contractor. Work on the bridge was started early in 1944 and trains began using it in November. Charles M. Ziegler is State Highway Commissioner of Michigan.

J. H. Patterson Heads Cummins Diesel Export

J. H. Patterson has been named Manager of the Cummins Diesel Export Corp., a subsidiary of the Cummins Engine Co., Inc., Columbus, Ohio, manufacturer of heavy-duty diesels for automotive and industrial service. Mr. Patterson, who has had twenty years' experience in developing service and sales organizations, and was formerly Division Manager of the National Refining Co., will maintain his headquarters at the office of the Export Corp. at 6303 Chrysler Bldg., New York 17, N. Y.

How a B-G Bucket Loader Can Save Money *the Year 'Round*

Truck loading time is cut to a minimum by the continuous operation of a Barber-Greene Bucket Loader. But more than that, the B-G Loader has year-round utility . . . can hustle along some construction or maintenance job each season.

★ The B-G Loader yields higher yardage, with less power, less weight, and less cost than any other method.

★ It can effectively handle a variety of loose materials—soil, sand, cinders, gravel or roadway debris.

★ Clean pick-up is assured with the follow-up scraper that cuts to grade and does light excavating.

★ Top performance in stockpile or semi-compacted natural deposit loading, light excavating, shoulder shaping or stripping to grade can be maintained with the 12 selective crowding speeds.

★ By substituting a B-G Snow Loader boom, the B-G Loader can be used for street snow removal.

Ask your B-G representative for details on the versatility and economy of B-G Bucket Loaders. Barber-Greene Company, Aurora, Illinois.

Barber-Greene B G *Constant Flow Equipment*

BOTH of these rollers embody new designs which were originated by the J. E. Ingram Equipment Company. Both are now in production and available for shipment on approved WPB order 1319s.

TYPICAL of all rollers manufactured by this Company, these two units are rugged, practical, long-lived. Many repeat orders have been received from some of the largest contracting companies in the U.S.A.

For More Uniform Compaction at Lower Operating Expense This PNEUMATIC-TIRED ROLLER'S the Answer:

Special features of this patented roller:

Wheels are roller-bearing-equipped.

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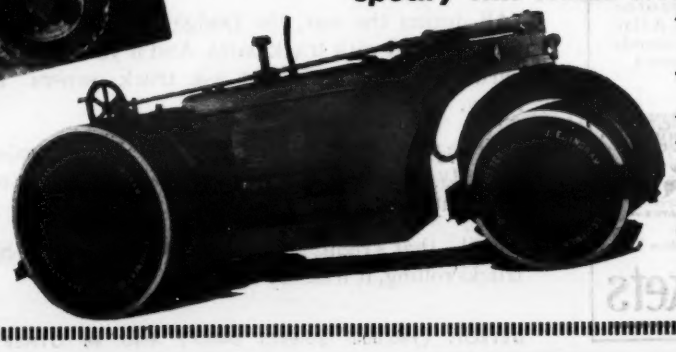
Electric welding throughout.

Low center of gravity—prevents upsetting.

Any medium-sized tractor easily pulls it.

Ground pressure 60-350 pounds per inch of tire width.

For Ruggedness Plus Variable Weight, Specify This THREE-WHEEL ROLLLER:



All wheels are cast hollow, so they can be filled with water or other ballast to increase the ground pressure.

The position of the front wheel yoke permits more oscillation.

All wheels are roller-bearing-equipped.

The front yoke is equipped with a roller thrust bearing, which permits easy steering and assures longer life.

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Chase County, Kansas, Tackles Bank Slides

Trouble Follows 1944 Floods, Method of Bridge Repair, Extensive Gravel Surfacing Program, Unit Organization

By M. C. JAILLITE, Former County Engineer, Chase County, Kansas

+ THE severe spring floods of April, 1944, in Chase County, Kansas, were followed by extensive bank slides or breaks along the Cottonwood River which caused considerable damage to bridge abutments. Sections of earth, from 50 to 200 feet in length and from 10 to 50 feet wide, sometimes suddenly and at other times slowly detached themselves from the banks and moved outward and downward towards the center of the stream. In many instances, the trees and brush carried with them remained nearly upright. The slides occurred at various locations, and not simply at the foot of hills where seepage is normally expected. This action is attributed to the fact that the river valley was submerged by flood waters for an unusually long period. Cracks in the soil, in some instances from 10 to 15 feet deep, remained from the drought days of a few years ago and tended to permit thorough saturation of the subsoil which carried the excess drainage towards the river. If the substrata at the river bank were inclined a slide resulted.

When a slide occurred behind a poorly founded bridge abutment, it was lost. The only serious damage experienced with large bridges during this flood occurred as a result of these slides. Two approach-span abutments were lost at different locations. Both were concrete, gravity type, and the foundations were relatively shallow.

Repair of Bridge

At one location, to repair the structure, the old abutment was removed with dynamite and the saturated material excavated to the plane of the slide. This was found to be a bed of impervious blue clay, sloping at an angle of about 40 degrees and outcropping at the face of the river bank about 3 feet above normal water level. This material was removed for a distance of 20 feet behind the new abutment and for 10 feet to each side.

Eight 8-inch steel bearing piles 40 feet long were driven to bedrock 18 feet below water level. Four piles were driven as a foundation bent and reinforcing for the face, two were driven at right angles 6 feet back from the abutment corners, and two at 45-degree angles 7 feet from the latter, forming the frame work for a box or U-type abutment. While being driven, the piles were held in position by two braced 3 x 12-inch plank frames, and were guided by four cables with turnbuckles. Exceptionally good results were obtained in this manner. The four piles forming the face were cut off 6 inches below the bridge seat, or 16 feet above the bottom of the excavation. The wing piling was left 18 inches longer, extending to the bridge floor level.

The wood forms were placed on this framework and the reinforced concrete was poured around the piling from the bottom of the excavation to the bridge seat and top of the wings. The pouring was done in three operations, sliding the forms up each time. The wall section at the corners was strengthened by fillets and the corner piling was completely encased. Holes were burned through the piling webs and dowel bars placed at 2-foot centers. Angle-iron posts and hand-rails were provided as the finishing touch.

The backfill was placed with the lifts sloping downward from the back of the abutment, in an endeavor to reduce the pressure of the fill against the structure. The completed job, not including the backfilling, cost $1,325.

Steel piling and concrete abutment for an approach span of a bridge in Chase County, Kansas. The original abutment was lost as a result of a bank slide following severe floods in April, 1944.

Geographical Features and Roads

Chase County, with a population of 6,000, is situated in the midst of the Flint Hills in east-central Kansas. Bluestem pasture in this and surrounding counties makes the locality known as one

(Continued on next page)

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BROS HEATERS
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A Bros Steam Generator can be wheeled into operating position and in 20 minutes from a cold start, deliver at full pressure, hot, dry steam in ample quantities for the job. Bros portable or Skid Mounted heaters are designed for fastest possible heating of two to five 10,000 gallon cars daily, and are used for heating storage tanks, thawing frozen culverts, heating concrete aggregates, operating pile drivers and many other applications of high pressure steam.
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Handles asphalts and tars at approximately 20° F. above their melting point. Transfers totally heated materials at a maximum rate of 325 g.p.m. when used as a pumper unit. Raises temperature of a 10,000 gallon tank car at rate of approximately 50° F. per hour after circulation has begun. Four distinct pumping speeds give maximum efficiency.
These versatile Bros heaters are the fruit of sixty years experience in the design and the manufacture of boilers. To get a complete picture of their extra value and extra earning power, write today for your free illustrated descriptive bulletin. Circulator Bulletin No. 1005 or the Tank Car Heater Bulletin No. 1006.
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BROS
DISTRIBUTORS IN ALL PRINCIPAL CITIES

Chase County

(*Continued from preceding page*)

of the finest grazing areas in the world so that the chief industry is, as might be expected, cattle raising. Many of the highways throughout the county are established along the creeks, where the farms are located. Curves are plentiful and sharp, and most culverts and bridges on the roads are situated at the base of the drainage area above, so that many structures of large size fall to the care of the County Highway Department.

Included in the 775 square miles constituting Chase County are 592.7 miles of public roads, of which 493.2 miles receive regular maintenance. In recent years 117.5 miles have been rebuilt to grades of permanent standards with drainage structures of adequate size. Right-of-way on roads of the latter type is from 60 to 70 feet in width, and the standard roadway is 26 feet.

Gravel Surfacing

A total of 327 miles of the highway system has been surfaced with crushed limestone and with pit-run hill or creek gravel. These materials are placed in windrows at the side of the road at the rate of 800 to 1,000 cubic yards per mile, preparatory to surfacing. An abundance of creek gravel is available in most sections of the county, so that the hauls are comparatively short. A Link-Belt Speeder LS-40 dragline is used for excavating the material and loading it into the County's five Chevrolet dump trucks. Since much of the creek gravel is obtained from below water level, it contains practically no binder. Some oversize material is present in all pits but no effort is made to avoid loading it, as long as it does not exceed 10 per cent in volume.

When the material has been deposited at the roadside, it is spread by motor grader, working it back and forth across the surface until the finer metal has separated and become bedded. The remaining oversize is placed in a windrow at the shoulder, where it is reduced by a Universal 9 x 12 portable crusher. Generally speaking, this gravel runs in size from 1½ inches down to coarse sand. The cost is from 30 cents to $1.00 per cubic yard at the roadside, depending on the length of haul, plus a royalty of 5 cents per cubic yard which is paid to the owner of the property where the pit is located.

Chase County's Link-Belt Speeder LS-40 excavator loading hill gravel for road surfacing operations.

Hill gravel, in the eastern part of Chase County, is found in beds from 3 to 12 feet thick. This material is loaded by the Link-Belt Speeder converted to a shovel. Care is taken not to use any gravel containing more than 25 per cent clay binder which is the limit for surfacing operations. Only a negligible amount of material exceeding 1½ inches in diameter is found in these upland pits. The cost of loading is no more than for creek gravel and the resultant costs at the roadside are practically the same. The gravel is spread by a motor grader to a width of 24 feet and is traffic-packed. The average cost for this type of surfacing has been slightly in excess of $550 per mile. It has been found very satisfactory for secondary roads carrying light traffic at comparatively slow speeds.

Chase County has no oil-mat surfacing on its highway system, although approximately 35 miles of highway on which traffic will justify its placement will probably be treated in the early post-war period as part of the County's highway improvement program.

Maintenance

Surface maintenance is handled by five Adams and two Caterpillar motor graders. Each maintenance section consists of about 70 miles, which is more than can properly be cared for even under the light traffic conditions prevailing over most of the county system. Each motor grader is equipped with a snow plow, kept readily available during winter months. It is practically impossible to keep the highways cleared during a storm so no plowing is attempted until it passes. Work then begins and continues day and night until all roads have been opened at least to one-way traffic. Following this, the

(*Continued on next page*)

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50 years of manufacturing blades has developed for you a special steel, milled through our own rolls and forged at the edges to give that extra wearing quality you need.
All widths lengths, and thicknesses. READY TO FIT YOUR MACHINE.
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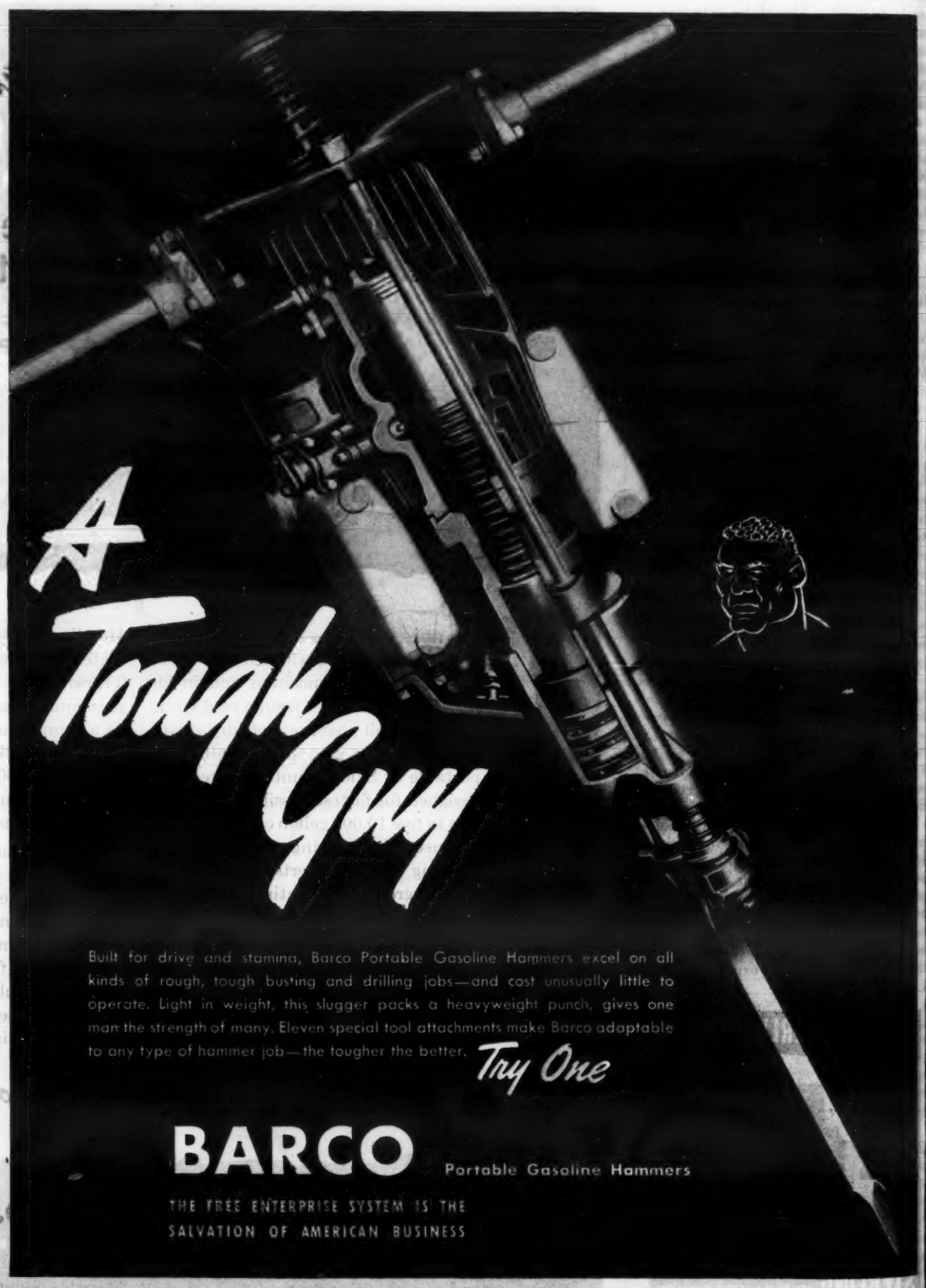
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Built for drive and stamina, Barco Portable Gasoline Hammers excel on all kinds of rough, tough busting and drilling jobs—and cost unusually little to operate. Light in weight, this slugger packs a heavyweight punch, gives one man the strength of many. Eleven special tool attachments make Barco adaptable to any type of hammer job—the tougher the better.
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Chase County

(*Continued from preceding page*)

lanes are widened as rapidly as possible, working during the day only.

A crew of seven men and a foreman are employed full time for miscellaneous small repair jobs throughout the highway system. This crew also erects the 12 miles of snow fence, placed at strategic locations, each autumn. Needless to say, this crew is never out of work.

Four track-type tractor and grader outfits handle all reconstruction operations. Each unit consists of a tractor, blade grader, hydraulic scraper, and wheel-type road ripper. Two units are powered by Caterpillar D7 tractors. One of the lighter units is powered by a Caterpillar Thirty-Five diesel and the other by an International TD-40. Each of these tractors is equipped with a snow plow for use in season. No heavy grading or ditching is attempted with the motor graders because of the rock encountered in most sections. For the heavier type of work, two 42-inch elevating graders are used. One is an old bull-wheel-drive Stroud, and the other a more recent Austin-Western with an auxiliary motor.

The Link-Belt Speeder dragline can be converted quickly to a shovel. This unit is used primarily for loading gravel but is also employed for ditching and pile driving. Purchased in 1941, we consider it one of our handiest pieces of equipment.

The truck fleet consists of seven 1½-ton trucks, of which five are Chevrolets with hydraulic dump bodies, one a Chevrolet with a winch and dump body, and one an International with a hydraulic dump body. The County also has five ½-ton Chevrolet pick-up trucks and three passenger cars.

Bridges and Culverts

The Cottonwood River flows northeasterly across Chase County, with fourteen county bridges crossing the stream. Twelve of these are steel-truss structures with average main-span lengths of 120 feet, and two are stone arches. Two of the truss bridges have concrete floors, one a bituminous mat covering a laminated 2 x 4-inch redwood floor, and the remainder have 3 x 12-inch plank floors. The roadways vary from 14 to 16 feet in width. All but two of the truss bridges are obsolete from the standpoint of design. In addition to these, there are twenty-three bridges with main spans from 50 to 100 feet across tributaries of the Cottonwood River, and one hundred eighty-six other small bridges with spans in excess of 5 feet, built of various materials, and at present in varying states of repair. These structures receive at least one inspection a year.

The bridge crew consists of eight men and a foreman to take care of major bridge repairs and the construction of new bridges. Normally this crew is supplemented by extra labor as needed. Since large quantities of building stone are readily available, most of the short spans of 10 to 40 feet are constructed with stone-masonry abutments. Steel I-beam stringers and concrete floor complete the superstructures. In longer spans, continuous I-beam construction with concrete piers and abutments is used, and State Highway Commission standards are followed. The roadway widths are usually 20 feet, although there are a few with 24-foot roadways.

Culverts are constructed either of reinforced concrete or with masonry abutments and concrete slabs. The roadways of most of the culverts are 26 and 28 feet wide. For quarrying stone, a Sullivan WK 312 portable air compressor is used to operate an air drill and paving breakers. The latter are also used for bridge excavation in shale. A 3-inch Sterling self-priming centrifugal pump is used for unwatering excavations and a 4-inch diaphragm pump with a Cushman Cub 2-hp engine also sees considerable use. A CMC 7-S mixer is used for most of the concrete work and a CMC 3½-S for mortar mixing and small concrete jobs. Both are trailer mounted.

Servicing Equipment

For servicing county highway equipment, a blacksmith and a mechanic are normally employed. At present, the County blacksmith is with the Seabees in the Southwest Pacific and the mechanic is assisted by the operators of such equipment as is being repaired. Each operator enters all expenses to his equipment in a monthly record book.

The repair shop, located at Cottonwood Falls, was built about 20 years ago. It is not adequate in size to care for the more modern road machinery although, with the exception of a lathe, it is fairly well equipped. A few years ago two snow plows were constructed for motor graders, and have since proved their value. A 4-wheel heavy-duty trailer, for use in transporting our tractors and dragline, was also built and this unit, equipped with eight good used tires, cost $638 complete. Tentative plans for a new and modern shop have been prepared for post-war consideration.

Like most highway organizations, Chase County will have considerable

(*Concluded on next page*)

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Pierce-Bear 2-5 Tons Variable Weights

Engineered for economical operation where the going is tough. Compact, easy to operate. Narrow rear roller gives heavy-duty compression. Built-in water tanks for wet rolling. Powered with Allis-Chalmers Industrial Heavy-duty Model "B" gasoline engine.

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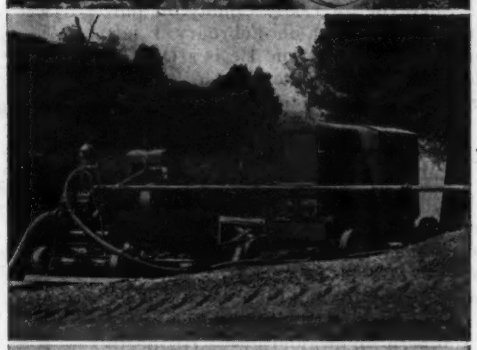
FROM START TO FINISH BUILD THE ROAD WITH BETHLEHEM STEELS



The Bethlehem hollow drill steel bites into hard rock, preparatory to blasting. From then on, there's a Bethlehem product to give rugged service, and to keep things moving along at top efficiency, in every important step in highway building.

Bethlehem Purple Strand Wire Rope lends a hand in the task of moving mountains of rock and earth, and in digging for sub-drains. Bethlehem corrugated sheets make culverts—or Bethlehem reinforcing bars go into concrete culverts. Bethlehem pipe carries water—many miles, perhaps—to the job.

Into the road go Bethlehem road joints, supplied assembled for placing. As the finishing machine moves along, Bethlehem bar mats are set in place. Then Bethlehem products mount guard along the completed highway—Safety-Beam or Cable guard rails, highway guard posts, right-of-way fence and posts.

Plan your postwar highways the Bethlehem way—by ordering all your road steel products from this one reliable source. It will save you time and, perhaps, many a headache. For full information about Bethlehem road steel service, get in touch with the nearest district office, or write direct to Bethlehem Steel Company, Bethlehem, Pa.

Chase County

(*Continued from preceding page*)

equipment ready for replacement after the war. We find our motor graders burdensome to maintain because of their long service, and two of the tractor and grader units are also ready for replacement as soon as possible.

Finances

The annual budget for roads and bridges in Chase County has been approximately $85,000, some $50,000 of this amount being assigned to roads. During 1945, there will be approximately $95,000 available for road and bridge maintenance and construction. Highway funds are treated as a unit in this county, there being no advance division of work or money to the commissioners' districts.

Organization and Personnel

Three county commissioners elected for a period of four years control the affairs of the county and the county engineer is appointed annually by the Board and has full charge of the Highway Department. The county unit system of highway maintenance and construction was adopted in 1929. All roads in the county, excepting Federal and state highways, are under the direct supervision of the County Commissioners and the County Engineer.

E. A. Bocook is Chairman of the Board of Commissioners, with Albert Odle and S. J. Cahoone, members. The author completed his ninth year as Engineer and Surveyor for Chase County on January 1, 1945, and on February 1 left the county organization. He is a District Vice President of the Kansas County Engineers' Association.

Charles D. Snead Dies

For the past fifteen years District Engineer of the Public Roads Administration, supervising the Federal-Aid highway program in Alabama, Georgia, Florida, Mississippi, and Tennessee, Charles D. Snead became a well known figure in southern highway circles. His death on February 13, 1945, after an illness of several months, is a great loss to the Federal and state highway programs and to his many friends and associates. One of his major interests in recent years was the Key West Highway with its many types of bridges. His special reports and aid in the preparation of plans for these bridges, many of which are notable for the deep-water foundations required, are valuable contributions to engineering literature.

Mr. Snead was a native of Virginia, graduated in engineering at Virginia Polytechnic Institute in 1906, and secured his C.E. degree after one year of post-graduate work at the same school. He was employed by the Virginia State Highway Commission from 1908 to 1916, and from 1916 to 1920 was in charge of bridge work for the Department of Public Roads of Kentucky.

In 1920, Charles Snead entered the service of the Public Roads Administration as Senior Highway Bridge Engineer. After a few months at the Fort Worth District Office, he was placed in charge of bridge work at the Montgomery, Ala., District Office. In 1930 he became District Engineer and has since supervised the Federal highway program in the five southern states. Recently his title had been changed to Division Engineer.

Cement—Magic Powder

A 287-page illustrated book, with 79 pages of supplementary text and a 16-page index, has been published under the title "The Magic Powder", telling the fascinating story of cement from the Pyramids down to the present war and presenting a detailed history of the fifty years of the Universal Atlas Cement Co. and its constituent companies. Essentially the story is of the Atlas Portland Cement Co. and Universal Portland Cement Co. and their union under the aegis of the United States Steel Corp.

The book, published by G. P. Putnam's Sons, New York City, is filled with illustrations and sells for $3.50.

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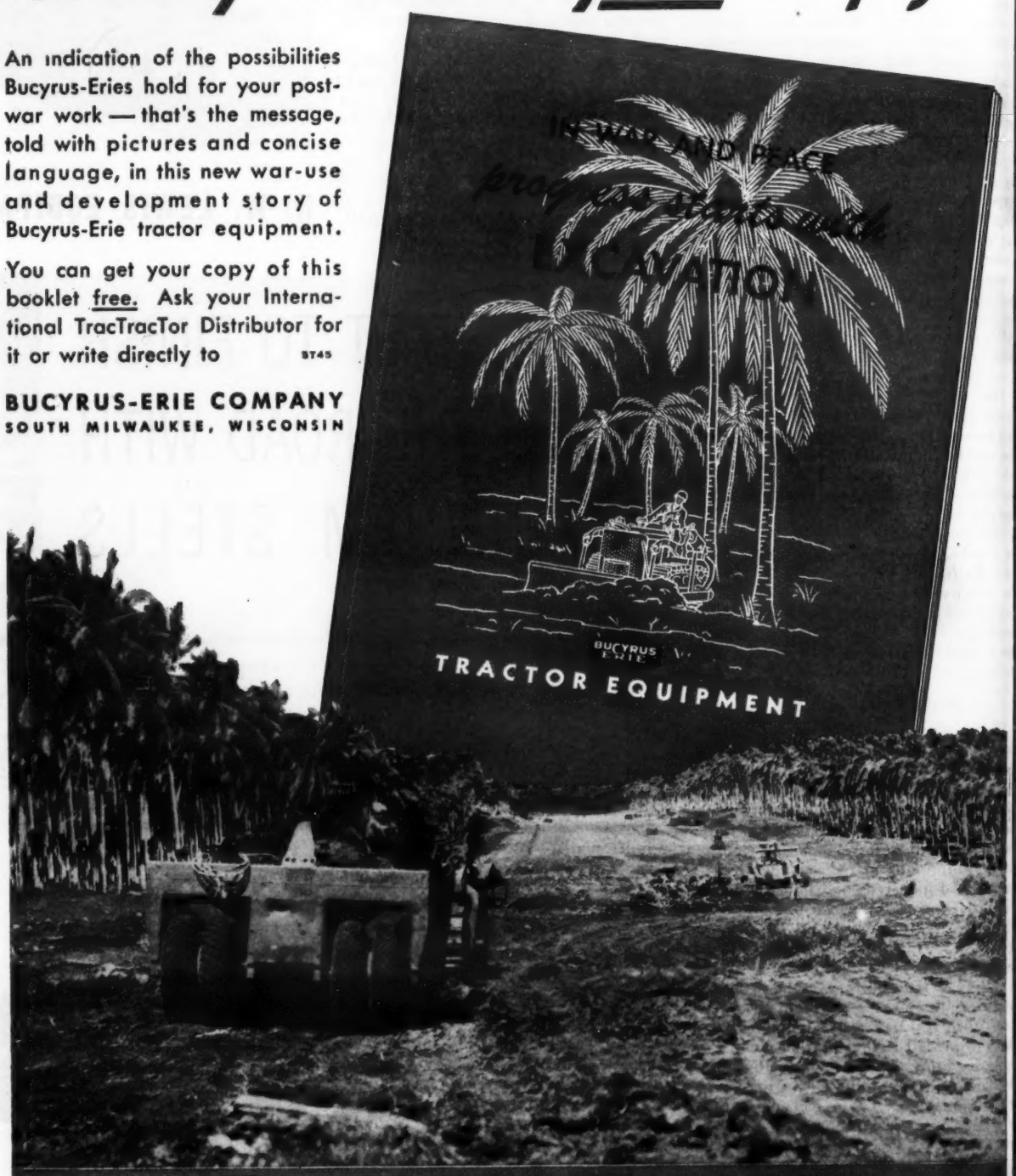

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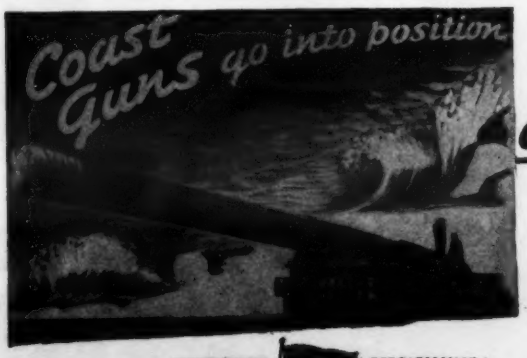

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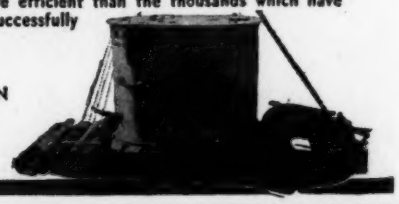
The ROGERS TRAILERS which will be available to industry when present war contracts are completed, will be even better-engineered and more efficient than the thousands which have been operated so successfully for many years.



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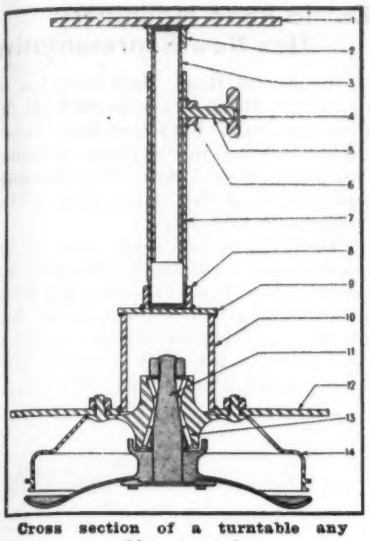

Cross section of a turntable any welder can make.

A Welding Turntable That You Can Build

A Foot-Power Turntable That Is As Handy for Holding Small Parts for Paint-Spraying Operations As It Is For Odd Jobs of Welding

✦ EVERY welding operator has frequent need for a good adjustable welding turntable with quick-change fixtures or attachments for easy positioning of cylindrical or irregular-shaped parts during welding. If a positioner is not available, the welder must stop frequently to change the position of the part, or else he must make the weld either by walking around the part or by trying to reach around or over it to get at the far side. This not only causes loss of time but often results in welds of inferior quality because the operator is obliged to work in an awkward or uncomfortable position.

In an effort to eliminate these inefficiencies, a shop in the middle west reported to *Oxy-Acetylene Tips* the development of a simple and inexpensive turntable which is proving highly satisfactory and can be made quickly in any highway or contractor's shop. We are glad to pass this on to our readers. The quick-change accessories shown in the illustrations make this turntable ideal either for repair and maintenance welding or for production work where speed is of importance. It revolves true, is readily portable, will withstand rough treatment, takes up little floor space, and looks neat and workmanlike. The operator revolves the turntable with his foot, but on repetitive production welding it can easily be rigged for power drive if desired.

Construction

The base and bearings of this turntable are the hub assembly of a discarded front wheel of an automobile, obtainable at almost any automobile graveyard. The hub of a pleasure car may be used for most welding work but, if the work pieces are to be heavy, it may be advisable to use a hub from a truck. The other parts can be fabricated with the blowpipe from scrap plate and pipe. The construction is quite simple, as shown in the sketch, but care must be taken that the parts are in true alignment.

The parts and dimensions as indicated by the fourteen index numbers in the diagram are: (1) the removable table, which is a flame-cut disk ⅜ x 10 inches; (2) half of a 1-inch pipe coupling; (3) a 10-inch length of 1-inch pipe; (4) a 2-inch hand wheel; (5) a ½ x 2¼-inch stud; (6) a ½-inch standard hex nut; (7) a 10-inch length of 1¼-inch pipe; (8) half of a 1¼-inch pipe coupling; (9) a flame-cut disk measuring 3/16 x 4¼ inches; (10) a 5-inch length of 3½-pipe pipe; (11) an axle; (12) a flame-cut disk ⅜ x 14 inches which replaces the automobile wheel; (13) roller bearing; and (14) a brake drum. The dimensions of the various parts can be altered to suit the requirements of any individual shop and the material available in the junk pile.

In general, the accessories or fixtures for accommodating different types of welding jobs can also be fabricated from scrap materials. The dimensions can also be changed to meet the requirements of the shop or even the individual job. Many accessories can be attached to the half coupling, No. 2, or merely attached to the 1-inch standard pipe, No. 3. Larger fixtures may either be placed on or attached to the top of the table, No. 1. These fixtures permit the operator to change from one welding operation to another in a matter of seconds.

Other Uses

In addition to routine welding operations, this turntable can be adapted easily to speed up other shop operations, such as circle-cutting for example. The piece of plate to be circle-cut can be placed on the table top and the blowpipe mounted on a suitable holder alongside the plate. Consistently good circles, with either square or beveled edges, can be produced in this manner.

The turntable can also be adapted for holding small or light parts for paint-spraying operations.

Above, the quick-change accessories which make possible the use of the welding turntable for many types of work. At right, the table has been replaced by the clamp.

Salvage all your waste paper!

PAA AIRWAYS SYSTEM PHOTOGRAPHS

To satisfy today's wartime demands and tomorrow's peacetime needs, a far-reaching expansion and improvement program is now under way on PAA routes all over the world. Out of jungles, swamps, dust and dangers, Pan American World Airways System is creating modern airports . . . many of them, we're proud to report, constructed with the help of Huber Rollers.

THE HUBER MFG. COMPANY ● MARION, OHIO, U. S. A.

HUBER ROLLERS

Howard Leaves Anthony

Richard R. Howard, Vice President and General Sales Manager of the Anthony Co., Inc., Streator, Ill., withdrew from these offices as of March 1, 1945. He will continue, however, as a Director of the company. At present he is serving on the Hoist and Body Advisory Committee of the WPB.

Mr. Howard joined the Anthony Co. twenty-four years ago when it was only a local shop. The company now has seventy representatives throughout the United States as well as plants in London, England; Johannesburg, South Africa; and Brantford, Ontario. Anthony was the first company in its industry to receive the Army-Navy "E" award, and now has a fourth star on its pennant.

Army-Navy "E" Awards

The General Excavator Co., Marion, Ohio, has been awarded the Army-Navy "E" for four years' production of critically needed excavating equipment for war construction and war industry in the United States and abroad. Previous to 1940, General Excavator produced a full line of power shovels, cranes, draglines, and related equipment for industrial and construction uses. In that year, the firm's war production effort was determined by the introduction of General's one-man-operated one-engine rubber-tired Supercrane which has been built for many Allied nations for service both at home and on the fighting fronts. In addition to this important contribution to the war effort, General Excavator is completing the development of its General Type 10, the "machine of tomorrow" which it plans to build after the war.

The Black & Decker Mfg. Co., Towson, Md., has recently received its third renewal of the Army-Navy "E" Award for excellence in war production. This recognition of the cooperative efforts of Black & Decker employees adds a third star to their "E" pennant.

Euclid Road Machinery Has New Representative

The Euclid Road Machinery Co. of Cleveland, Ohio, has appointed W. W. Paape as Sales Representative, temporarily covering the territory including Ohio and adjacent states. His headquarters will be at the main offices of the company in Cleveland.

"Bud" Paape has been active in the construction equipment industry for twenty years. Prior to joining Euclid he was Sales Manager of the Syracuse Supply Co., and before that he served as representative for the Caterpillar Tractor Co. and LaPlant-Choate Mfg. Co.

the Job— Placing 600,000 sq. yd. of black top pavement in 80 working days

LAYING the binder and top courses on twenty-five miles of two-lane roads and a lesser mileage of secondary roads in one of the new naval training stations is another of the rush jobs completed in record time by Adnun Black Top Pavers.

These machines showed their dependability by staying on the job 10 hours a day, seven days a week until the first part of the pavement had been completed and then to speed up construction, the day was lengthened to 12 hours. Here, too, was a typical example of their versatility—each machine laying either the thick binder course or the thin top course with the width and depth controlled to meet every specification. Continuous course correction, an exclusive feature of Adnuns, automatically corrected hollows and bumps with each successive course, reducing all irregularities to insignificance. With an Adnun you can build highways and airports with the minimum of subgrade preparation, with tight joints between strips, maximum density, smoothest finished surface and all-weather durability. Write today for details or see your Foote distributor.

the Equipment FOUR ADNUN BLACK TOP PAVERS

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ARMY E NAVY

ADNUN
TRADE MARK REGISTERED
BLACK TOP PAVER
WITH CONTINUOUS COURSE CORRECTION

U. S. Army Signal Corps Photo
A section of an M-4 gear drive is repaired by welding at an Ordnance Repair Station somewhere in France.

Mobile Repair Unit Uses Rebuilt Parts

Up front in Belgium, an Army Ordnance heavy automotive maintenance company under the command of Capt. Dickson L. Griffin of Kilgore, Texas, is tearing down anything from jeeps to mammoth tank retrievers and often "refits them with rebuilt parts that are just as good as new", according to the Captain. That sounds a lot like the story we have heard for nearly four years on the home front in central and district highway shops and garages where they say, "We are using parts we rebuild ourselves, because we can't get new parts".

The company has its shop set up on skids, so entire units can be moved intact. These include a welding shop, a blacksmith shop, tool room, machine shop, and engine and chassis shop. The company also has a home-made mobile battery charger and tire repair unit, a radiator repair section, a paint shop on wheels, and a carburetor and ignition trailer, and, "believe it or not", a supply trailer carrying more than 2,500 parts, as well as tarpaulin repair and isinglass replacement divisions.

The company's primary job is to keep the supply trucks of the fighting armies running, and this takes not only a well trained body of mechanics but the stocking of mobile warehouses with sufficient parts to carry on. The time limit for the stripping and rebuilding of used trucks is 72 hours, but the average vehicle is ready for re-issue in 24 to 48 hours after it enters the shop. Any vehicle taking more than 72 hours to repair is replaced by another rebuilt model.

According to an overseas report, the company has rebuilt 10,000 Ordnance trucks, repaired over 5,000 captured small arms, and more than 15,000 U. S. small arms since landing on the European continent last July 4. The company, now located in a former Nazi supply warehouse in Belgium, has established an enviable record. In its first month of operation on the continent it refitted and overhauled more than 3,000 enemy vehicles, later released for use by Allied forces.

First Lieutenant Henry P. Zelasko of Conneautville, Penna., shop officer, explained that every truck brought in goes through a standard process. "We inspect them for defects", he said, "and issue a job order at the shop office. Then we allocate the work, and the truck is taken into the automotive repair section where it is stripped down. Everything is examined from the motor, transmission, differential, clutch and axles, to the isinglass in the side curtains and even the tarpaulins. When the job is done, the new motor set, the canvas repaired and the truck spot-painted, it is given a road test and a final inspection before being turned over to the using unit. Out of every 50 vehicles brought in, we turn out 40 to 45 rebuilt jobs. We can replace an engine in four to six hours, a clutch is installed in less than an hour, a transmission takes about two hours to fit, and a transfer case can be completed in ninety minutes."

M/Sgt. Frankie H. Stoltenburg of Arlington, Wis., shop foreman and master mechanic, described the first days of operations on the Continent. "We landed on July 4," he said, "and set up in a field just below the invasion beaches to service the trucks supplying the men pounding the Wehrmacht at St. Lo. We acted as a collecting point for captured matériel, and turned out 5,500 enemy weapons — Czech, French, German, Austrian, Belgian, Italian, and Rumanian makes. We also repaired more than 5,000 Nazi vehicles and repainted them, marking them with the Allied white star, for use by United Nations forces."

Lincoln Electric Names Persons Asst. Sales Mgr.

The appointment of W. R. Persons as Assistant Sales Manager has been announced by the Lincoln Electric Co., Cleveland, Ohio. In this new post, he will act as assistant to C. M. Taylor, Vice President and General Sales Manager.

"Buck" Persons started out with Lincoln Electric ten years ago as sales and service representative in western Pennsylvania. Four years later he was appointed branch manager of the firm's Pittsburgh office, continuing at this post until he was transferred to the home office at Cleveland last year.

It's easier to lift, lower, push or pull the Simplex Way!

Simplex LEVER SCREW HYDRAULIC Jacks

for every construction purpose

Awarded the Gold Medal for Safety

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Automatically Lubricated

Thor SUMP PUMPS

KEEP YOUR JOBS IN THE DRY

EASY TO CARRY!

Thor automatically lubricated sump pumps are designed and manufactured to operate most efficiently on the toughest jobs under the most unfavorable conditions. The Thor rotary air motor is enclosed in an airtight, foolproof housing to assure steady operation whether partially or fully submerged. Because of their self-priming, centrifugal impeller type construction, Thor sump pumps will operate in the dirtiest of water —in oil—in sludge or in sewerage, at peak efficiency. For the best in sump pumps call your nearby Thor distributor today.

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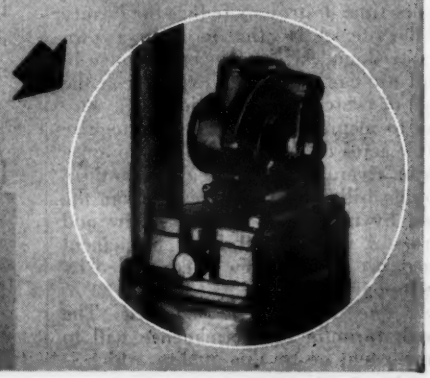
Thor pumps are equipped with a highly efficient automatic lubrication system. The oil is fed from a built-in oil reservoir to the rotor blades and the cylinder bushings in a fine continuous spray. Live air pressure provides continuous application of grease to the impeller hub and bushing.

VARIABLE SPEED CONTROL

The Thor variable speed throttle accurately controls the speed and capacity of the pump. This is a hand lever that can be set to pump up to 244 gallons per minute at 90 lbs. air pressure, or to idling speed where it pumps slowly.



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Branches in Principal Cities

Better War Memorials For Roadside Areas

(*Continued from page 6*)

interested in a simple type of memorial, available to people of the smaller villages and towns, and developed on roadsides of main highways in the open country.

For several years there has been a growing belief among highway engineers and other public-spirited citizens, both here and in Great Britain, that there are places of exceptional natural beauty along our open county roads which can and should be preserved for all time. Perhaps here lies an answer to the problem. It may well be that in the best of these natural wayside areas lies the foundation for the best of all memorials —a bit of America herself.

Foundation of the Memorial

The selection of a fine roadside area and the setting of a bronze plaque upon a boulder will not constitute a war memorial. Two things must be done to make a memorial; (1) an exceptional wayside area must be selected, and (2) the area must be designed as a memorial and developed for convenient and safe traffic use and for driver service, without damaging the natural features which make the site worthy of selection.

Both of these are problems in landscape design, requiring a professional skill and "lightness of touch" at least equal to that required in the design of the most costly urban war memorial featuring works of stone and bronze.

Selection of Site

Here are some of the basic principles of engineering and landscape design to be considered:

1. *The site must be well located.* A wayside area on a primary highway in the vicinity of a town or village will meet this requirement. The memorial must be seen and enjoyed by many travelers if it is to be of value.

2. *A memorial site must have memorial quality.* The place selected should be one which people will see, and long remember, and return to whenever they pass that way again. Those who have traveled hundreds of miles of American highways remember places which for lack of a better word we may call "unforgettable". Most of these will be old places—old mill ponds, groves of old trees, and spots from which old, permanent, unchanging things are seen, a lake, a mountain, a river, or the sea, or long stretches of rolling prairie, fields of wheat, or acres of marsh grasses.

3. *The site must be permanent.* A memorial, if it is anything, is permanent. That is one reason why a "pretty good memorial" will be like a "pretty good egg"—not nearly good enough. Therefore, the place for a memorial should be located, for example, on a section of highway which will not require relocation for a generation or more; in a grove of permanent long-lived trees, not likely to be destroyed by insects or disease; in a place where the view includes permanent unchanging things, and where gas stations or billboards or industrial or resident development will not at some future time destroy or reduce the beauty of the site. A location too near a town or city is undesirable because change in land use can always be expected at the edge of centers of population. One sure way to insure permanence is to acquire a few acres of shoreline on a lake, on a major river, or on the sea; or again a sloping hillside area, screened from the road by trees, with a view below and across a valley, will be a permanent place, because the view is controlled by the topography itself.

4. *The site must be beautiful.* The rough formula for permanence will to some extent insure this quality, which is the hardest of all to write into a specification. As an engineer with thirty years of highway experience said at a meeting of the Association of Highway Officials of the North Atlantic States in February, 1936, "Almost without exception the natural landscape is beautiful". Good monuments of stone and bronze may also be beautiful. Rusty tanks and bronze doughboys may be valuable chiefly as scrap metal, because they lack this quality.

5. *The site should be capable of serving a traffic need.* It must be potentially useful. As a number of state highway departments have discovered, the traveling public appreciates safe, clean, conveniently designed wayside areas developed for rest, water supply, and incidental recreation. Let us consider examples of a few of the types of traffic and driver service which can be provided off the traveled way.

On long ascending mountain grades radiators *will* boil over, and places should be provided where a vehicle can

(*Concluded on next page*)

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Superior Features

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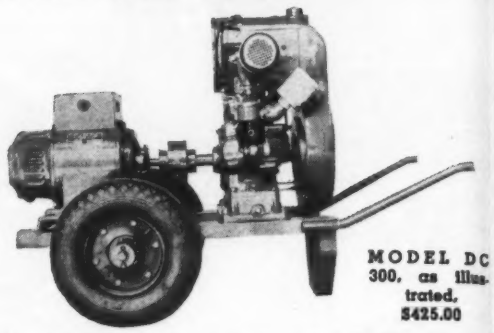

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"You can take it from me," said a well known contractor—"Rex has really got something in that shockproof girdle—the Chain Belt Drive that goes completely around the drum of a Rex Moto-Mixer."

Road shocks, strains of sudden stops and starts with a loaded drum are cushioned by the flexible Chain Belt Drive . . . are not passed on to transmission, power plant and other vital working parts. This feature also assures lower maintenance, fewer repairs and far longer truck life.

But the Chain Belt Drive isn't the only outstanding feature. For example, there's the new exclusive mixing action that enables Rex Moto-Mixers to mix low slump concrete . . . *fast!* The new easy-to-replace mixing blades that are *bolted* to the drum. The patented method of water entry that introduces water behind the blades, right where the actual mixing action takes place. The special Rex water system that allows water to be drawn off in any desired quantity—on all sizes of mixers.

Rex Hi-Discharge Moto-Mixers have been consistently improved, but the basic design has remained unchanged because it was *right*—from the start!

For complete information about the Chain Belt Drive and other outstanding features, see your Rex distributor or send for your copy of Bulletin 405. Write Chain Belt Company, 1666 West Bruce Street, Milwaukee 4, Wisconsin.

REX CONSTRUCTION MACHINERY

PUMPS PAVERS PUMPCRETES MOTO-MIXERS MIXERS

Better War Memorials For Roadside Areas

(*Continued from preceding page*)

safely leave the road. In summer, provision of shade in a safe place is an important driver service. Enjoyment of scenery is a main reason for pleasure driving, and scenery is best enjoyed when your car is no longer moving. It may be said that a thing which is scarce or hard to find in a locality will be most desired by travelers as part of a wayside. That is, in settled country where trees have been destroyed, fine groves of trees are most appreciated; or again, on semi-arid or desert roadsides, there is nothing like a drink of clean, cold water. These things can be provided without sacrificing the essential purposes of the memorial.

Design of the Roadside Memorial

Every wayside area will be a different problem in landscape and engineering design. Traffic and driver service requirements differ on any two main routes, and on each section of highway. Local customs and preferences of the people in nearby towns differ. Climate, existing types of trees and other growth, and topography and soil add further complications to be solved by the landscape engineers.

There are no "standard specifications" for wayside memorial development. The following principles of design should, however, provoke serious thought on the part of highway engineers and civic leaders who may be concerned with roadside memorial development:

1. Design and construction should be aimed at preserving for all time the trees, weathered rock, shorelines, the view, and other natural features which influenced the original selection of the wayside area.

2. The memorial monument or marker should have "a place of honor", preferably along one side of a prominent open space. This place should, where possible, be separated by natural convolutions of the ground, or by planting, or otherwise, from the parking space, picnic tables, and other service areas.

3. Traffic safety and convenience in the form of adequate, surfaced parking space, and safe access and egress on surfaced driveways are essentials for all wayside area designs.

4. Aside from the memorial features, driver service is the main justification for wayside development. Design may include, in addition to the above, such appropriate structures as: water supply, simple tables and benches and stone fireplaces, comfort buildings, open-stone or timber shelters, creosoted-timber or stone curbs and rails, masonry walls, and other installations necessary for convenient public use.

5. The less planting required on natural areas the better, but seeding and planting may be necessary to merge driveways, parking space, and structures into the natural setting; to screen portions of the wayside area from the main highway, or from other parts of the area; to replace essential trees destroyed in construction; to provide shade over tables and use areas; to protect against erosion any soil laid bare during development; and to provide an improved background or setting for the monument or memorial marker.

6. All designers should bear in mind the work of the maintenance crews which will be required in the years after construction. A well designed memorial wayside should, for example, require little or no hand mowing. By using native plant materials of types already growing on the site, need for maintenance work such as spraying, cultivation, and pruning will be avoided.

7. Stone walls and stone structures should be of weathered native stone. Quarried or cut stone may detract from the open country atmosphere of the memorial. Any sort of painted timber may have the same effect. Good stone and timber work is an unmistakable hallmark of professional design. There will rarely be a place for concrete in above-surface structures on areas outside towns or villages.

Acquiring Memorial Areas

A few points regarding the acquisition of wayside memorial areas may be of interest here.

First, the best time to acquire the land for a memorial is before construction on a new highway begins. On completed or existing highways, desirable sites, particularly those on shorelines, may have value for private roadside business development and the cost of acquisition will rise accordingly.

Second, the finest type of cooperation by civic groups and garden clubs may be in the acquisition of sites selected by the state landscape engineer for memorial development.

Third, some of the finest scenic wayside areas are rough, steep, and rocky and of no value for agriculture or industry. As a matter of fact, good level farm land is not usually desirable for wayside development.

Fourth, demand for space for new war memorials along our highways is certain to increase after this war. A survey of roadsides on main highways outside towns by the state landscape engineer, or a competent consulting landscape designer, is one way to be ready for this post-war problem. Also the routes of new highways should be examined by the landscape engineer for potential memorial sites before construction begins. Such work will pay dividends in increased public cooperation in acquisition and development of highway rights-of-way for the improvement of roadsides and for wayside memorials.

The writer has had the opportunity during the past year to study the literature of war memorials and to see photographs of some outstanding memorials as they were developed on the ground. One fact stands out above all others. The most effective war memorials here and in Europe were designed, not by the sculptor, the architect, or the landscape architect working alone, but by these three with the engineer, working together professionally toward a single end—the development of the finest memorial which could be produced on the selected site.

From a paper presented before the American Association of State Highway Officials at Cincinnati, Ohio.

New Cataphote Dealers

Two new distributors have recently been named by the Cataphote Corp., 958 Wall St., Toledo, Ohio. The Rish Equipment Co. of Roanoke Va., with branches at Richmond and Roanoke, Va., and Clarksburg and Charleston, W. Va., will handle the distribution of Cataphote reflectors and signs in the states of Virginia and West Virginia.

The Lang Co. of Salt Lake City, Utah, has been appointed Cataphote distributor for the state of Utah.

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Gentlemen:
From the first of May until the first of November, we have applied in the State of Ohio for the State Highway, County and City Highway Departments a total of 807,000 gallons of asphalt, using a Littleford "Spray Master" Pressure Distributor.
We wish to inform you that this "Spray Master" did a remarkable job in applying this material. As you know, our Model CLAC "Spray Master" is four years old, and it has applied during that time many more times 807,000 gallons with the minimum of repairs.
Very truly yours,
Greenville Bituminous Products Co.
By Robert C. Manix
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Greenville "Spray Master" on the job.
807,000 GALLONS
OF ASPHALT IN
6 MONTHS
The "Spray Master" Pressure Distributor finds another satisfied user because it is simple to operate and 100% efficient when building or maintaining Roads, Streets, Highways and Airport Runways. With the Littleford Vacuum-Flow Full Circulating Spray Bar, the "Spray Master" sprays bituminous materials accurately. The spray starts and stops instantly, no dripping or dribbling on the road.
Littleford "Frameless" Constructed "Spray Master", the new feature that eliminates a trailer or truck frame, can be had in Semi-Trailer models similar to the Greenville Bituminous Products Company's unit shown here. Make your new distributor a "Spray Master".
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BLACK TOP ROAD MAINTENANCE EQUIPMENT
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LITTLEFORD BROS., INC.
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Base Strengthened Prior to Concreting

Heavy Clay, Old Corduroy and Muck Were Removed; Sand Backfill, New Subsurface Drains on Michigan Route 50

✦ A LOT of work was done in a short period of time by Detroit contractor Louis Garavaglia & Son on a 4.8-mile grading, drainage, and concrete paving contract on State Route 50 near Tipton in Lenawee County, in southeastern Michigan. The contract required replacing the weak subgrade with a minimum 15-inch layer of sand sub-base, and improving the gradients. Where the new grade was at least 15 inches above the original concrete, the old pavement was left undisturbed but otherwise it was removed. The old 18-foot concrete pavement, built in 1920, had been patched and seal-coated, but was in very poor condition due to poor drainage of the heavy clay sub-base. At three locations where embankment had been placed over muck and peat, old corduroy was found. During the excavation and wasting of the peat, a total of 872 feet of corduroy, measured along the road center line, was removed. Work was started on August 15, 1944; paving operations were begun on September 29 and completed on November 28; and the project was opened to traffic on December 8. The remainder of the work of final trim and clean-up and sodding will be completed this spring.

A subcontract for removing 33,866 square yards of old pavement and the laying of 61,365 square yards of 8½-inch uniform-cross-section plain-concrete pavement was given to the Oak Construction Co. of Royal Oak, Mich., for $140,719.60. The pavement was broken into rubble ranging from head-size down to gravel by a Worthington pneumatic breaker mounted on a Mack truck. The old concrete, which broke easily, was loaded by a Bucyrus-Erie ¾-yard power shovel into 5-yard trucks which distributed the material along the road in the fill sections where it was incorporated with the fill material, care being taken to fill all voids with sound earth.

The old 66-foot right-of-way was increased to 120 feet, so that the Tipton Telephone Co. of Tipton and the Consumers Power Co. of Jackson, Mich., had to move their pole lines back 30 feet to the new right-of-way limits.

Sand Sub-Base

As the new concrete pavement is 22 feet wide with 8-foot shoulders, the 15-inch minimum depth of sand sub-base was spread 39 feet wide at the top, averages about 50 feet at the bottom, and has a slope of 0.02 foot per foot from the center of the road to the ditch line. In four locations, peat 8 to 10 feet in depth was removed over distances of 100 to 500 feet and replaced with sand. Excavation and grading were done by a Lorain 1½-yard dragline, a Bucyrus-Erie 1-yard shovel, two 15-yard Gar Wood scrapers, a LeTourneau 19-yard scraper, an Allis-Chalmers tractor used as a pusher, and a Caterpillar D8 tractor with a bulldozer. During the grading, the topsoil was salvaged and stockpiled, and later placed on the shoulders and stabilized for a 6-inch depth with the underlying sand.

Two borrow pits, one located 3 miles from the easterly end of the job and the other 1 mile from Tipton at the west end, furnished a good porous sand-and-gravel mixture for the sub-base. The east pit supplied about 60,000 yards while the west pit provided around 50,000 yards. The borrow pits were worked by a Bucyrus-Erie 1-yard shovel and a Lorain 1½-yard shovel. Fifty trucks, from 3 to 5-yard capacity and of various makes, half of which were owned by the contractor and the rest rented, hauled the fill from the borrow pits to the job site. The sand was

(Concluded on next page)

No matter what your off-the-highway hauling problem may be . . . big loads . . . steep grades . . . short or long hauls . . . Rear-Dump and Bottom-Dump EUCLIDS will move more pay dirt faster and at lower cost. Built in every part for tough hauls, Euclids combine minimum vehicle weight with maximum power and strength for large capacity off-the-highway hauling.

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EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH ROCK COAL ORE

SUPER-PERFORMANCE

Like that of the B-29, Owen superiority is based upon a thorough knowledge of the problem, expert designing and precision manufacturing from the most appropriate materials available.

The OWEN BUCKET Co.
6838 Breakwater Avenue, Cleveland, Ohio
Branches: New York Philadelphia Chicago Berkeley, Cal.

OWEN BUCKETS A MOUTHFUL AT EVERY BITE

EQUIPMENT DEALERS' NOTICE

Subject to prior sale: 200,000 ft. ¾-2-braid moulded non-kinkable, heavy-duty water hose coupled 3 pcs. to 50' at 12c (retails 18c). Also 1", 1¼", 1½", 500' reels, also steam, oil, fire, air, gas, hose. Conveyor and regular belting to 24". All prewar quality. No priority. From factory stock at once.

H. W. Sullivan
Factory Representative
526 Mason Street, Owosso, Michigan
Phone 1582 Black

Acme Photo by Chas. Haucker, War Pool Correspondent
Getting to work immediately after they occupied the town of Rennes, France, a U. S. Port Reconstruction Unit, U. S. Army Engineers, maneuver a Buckeye Clipper crane into position as they build a new bridge across the canal at Rennes, after fleeing Germans destroyed the original bridge.

Base Strengthened Prior to Concreting

(Continued from preceding page)

dumped in the areas where the clay had been removed, spread out by two Allis-Chalmers tractors with bulldozers, and shaped to grade by a Caterpillar power grader. Placing of the sand sub-base was started at the eastern extremity of the job, and as the fill was constantly being trucked over, no compaction with rollers was necessary.

Drainage

Along most of the length of the road, open side ditches sufficed for drainage, but for sections through the village of Tipton, where ditches could not be used, a 12-inch-diameter concrete pipe was laid with open joints 20 feet from the center line and 5 feet below grade to provide both surface and sub-base drainage. In other locations, where a high water-table was encountered, a 6-inch concrete pipe was laid 14 feet from the center line and 5 feet below grade. The bell-and-spigot joints of both these pipes were covered with a 3-inch layer of straw and the trenches backfilled with bank-run gravel. Trench excavation was done by a Northwest ¾-yard Pullshovel and proceeded concurrently with the road grading.

An 8-foot-wide x 7-foot-high slab culvert was extended 20 feet 6 inches on each side of the road, with walls and roof of 10-inch-thick reinforced concrete. As the flow line of this culvert was lowered 2 feet, it was necessary to place channel paving and footing supports under the old section of the culvert.

During the grading and drainage operations, local traffic along the road was maintained, but through traffic was detoured over a parallel road 4 miles to the north.

Concrete Pavement

The 22-foot plain-concrete pavement 8½ inches thick has a 1¼-inch parabolic crown with a longitudinal center joint 2½ inches deep filled with bituminous material. Expansion joints were placed every 240 feet with intermediate contraction joints at 40-foot spacing. At county-road intersections, a 30-foot approach of 5-inch compacted gravel was laid on each side of the new concrete highway and then covered with 2½ inches of a bituminous mix.

Equipment used by the Oak Construction Co. in placing concrete pavement included a Koehring 27-E paver, a Jaeger-Lakewood double-screed finishing machine, and a Koehring Longitudinal Finisher. The concrete was cured with Aquastatic membrane curing compound until October 15, after which, until the paving was completed, wet straw was used.

Quantities and Personnel

The major quantities on this job, which was built entirely with State funds, were as follows:

Removing old pavement	33,866 sq. yds.
Excavation, earth	183,430 cu. yds.
Reinforced-concrete pipe for culverts, 12 and 15-inch	600 lin. ft.
Plain-concrete pipe for culverts, 12 to 24-inch	1,154 lin. ft.
Sewer pipe, concrete, 6-inch	4,850 lin. ft.
Sewer pipe, concrete, 12-inch	1,049 lin. ft.
Underdrain, tile, 6 to 24-inch	828 lin. ft.
Pavement, concrete, 8½-inch uniform	61,365 sq. yds.
Sidewalk, concrete	1,182 sq. ft.
Topsoil surfacing	3,280 cu. yds.

This grading and concrete paving contract on M50 near Tipton was awarded to Louis Garavaglia & Son, Detroit, Mich., by the Michigan State Highway Department for $263,737. Lynn Vanderjagt supervised the sixty men employed by Garavaglia on this contract. Charles M. Ziegler is Michigan State Highway Commissioner.

Buy, and keep on buying, War Bonds.

Detroit Expressway Opened for Traffic

The great Willow Run-Detroit Industrial expressway, which links the Ford Willow Run bomber plant and the Ann Arbor-Ypsilanti area with Detroit, is now in complete use, the final section of this route having been opened to traffic on March 9, 1945, with an appropriate ceremony near Michigan and Wyoming Avenues in Detroit.

Built to speed men and materials between the bomber plant and the Detroit labor reservoir during the war, the Expressway will offer a speedy entrance and exit to the Detroit area after the war for highways west and south of the metropolis. Articles on the construction of the Expressway appeared in C. & E. M., January, 1945, pg. 41; February, pg. 9; and on page 25 of this issue.

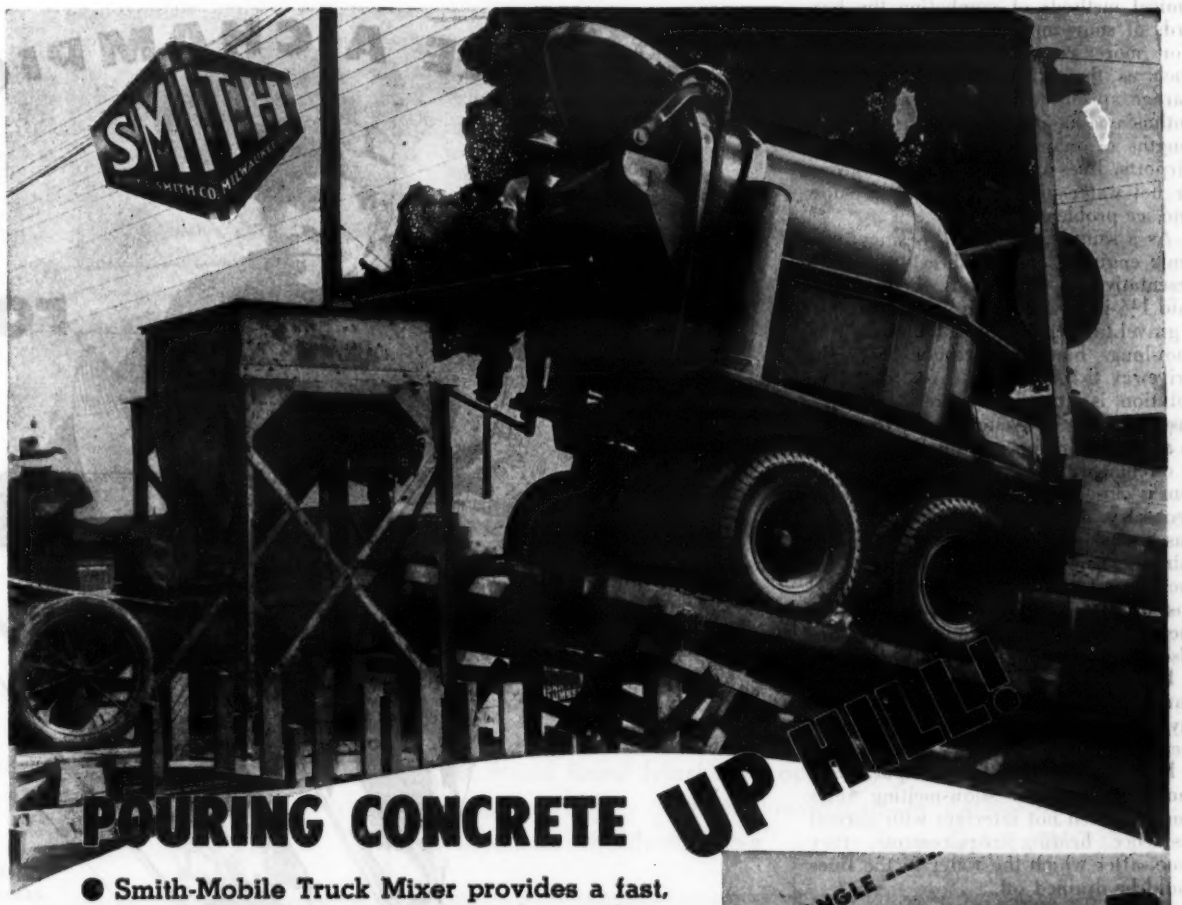
Plan NOW—for NEXT Winter

DAVENPORT-FRINK SNO-PLOWS

ALL TYPES AND SIZES

—should be top choice in your desire for FASTER ● SAFER ● CLEANER Snow Removal. Whatever lies ahead, it's wise to determine your needs promptly and place orders EARLY. We'll cooperate with you in every way. Write us for Complete Information.

DAVENPORT BESLER CORPORATION Dept. A
Made in Eastern U.S.A. by CARL H. FRINK. DAVENPORT, IOWA
1000 Islands, CLAYTON, NEW YORK



POURING CONCRETE UP HILL!

● Smith-Mobile Truck Mixer provides a fast, controlled discharge *even when the machine is on a steep incline.* The patented T-shaped blades scoop up the thoroughly mixed concrete and carry it swiftly to the discharge opening, without segregation. The speed of the drum controls the speed of discharge and a smooth steady flow results, even on an up-grade.

Smith was the FIRST truck mixer manufacturer to introduce a HIGH DISCHARGE model, eliminating the need for a rear-end hoist with its original extra cost, dead load and maintenance expense. And Smith-Mobile pioneered many other time-tested truck mixer features. It will pay you to investigate. Write today for Catalog No. 198-C.

The illustration above shows a No. 4 Smith-Mobile, one of a fleet operated by Western Concrete and Equipment Company and used in the construction of a Southern California war plant. This Smith-Mobile is discharging concrete into a high floor hopper. The ramp is a 14° grade and the axis of the mixer drum is 18° from horizontal — yet the speed of discharge is NOT seriously affected by this steep incline.

The T. L. SMITH CO., 2857 N. 32nd St., Milwaukee 10, Wis.

SMITH-MOBILE

The ORIGINAL HIGH DISCHARGE Truck Mixer and Agitator

A snow-free driveway in Pittsburgh, achieved by underground pipe lines which not only melt snow but evaporate the resulting water.

Melting Deep Snow At Strategic Points

Many ideas have been expressed in print in the past on methods of melting snow as it falls. Salt and calcium chloride still seem to be the most economical methods of combating the hazards of snow and ice on our highways. For more congested areas, however, such as the driveways from garages, garage aprons, and, as one air-minded enthusiast has pointed out, for the lengths of major runways at post-war airports, lines or grids of steam pipes or hot water pipes can solve the snow and ice problem.

As a sample, Joseph C. Keaney, ceramic engineer and manufacturers' representative in Pittsburgh, Penna., has laid 1¼-inch wrought-iron pipe lines in a gravel fill beneath the 2-foot-wide 100-foot-long black-top ribbons of the driveway to his garage. An anti-freeze solution is heated in a residence-type instantaneous hot-water heater to which is attached a pump and small motor and is circulated through the lines. The system is closed and is operated only when necessary. Mr. Keaney states that it has melted a ½-inch layer of ice in 20 minutes, and recently removed a 15-inch snowfall in two hours at a fuel cost of 60 cents. In addition to melting the snow, the underground heat lines also evaporate the resulting water.

Engineers of A. M. Byers Co., Pittsburgh, Penna., who have studied the layout, suggest that a similar arrangement of coils could readily operate from a hot-water boiler. The comparatively short periods that snow-melting lines function need not interfere with normal residence heating requirements, they state, after which the water in the lines could be drained off.

Synthetic Rubber Now Supplies Most Needs

Unbelievable as it may seem, American scientists, engineers, and production men in five years have achieved with synthetic rubber what it took nearly 70 years to accomplish with natural rubber. Today American man-made rubber constitutes 85 per cent of the overall volume of rubber this country is using, according to James J. Newman, Vice President, The B. F. Goodrich Co., Akron, Ohio. This has been a lifesaver, for today we are nearer the bottom of the natural-rubber barrel than we have ever been, with military requirements continuing to mount as our active war front widens and supply lines lengthen.

In 1941, tire-type synthetic production amounted to 6,000 tons, or less than 1 per cent of the total consumption. This has developed to 565,000 tons actually consumed in 1944, while the production in that year exceeded 750,000 tons. Synthetic rubber is used up to 100 per cent in many war products seeing the most rugged service. At present only one type of military tire is still made with 100 per cent natural rubber and the overall tire average is 86 per cent synthetic.

Worthington Preview Of Post-War Products

A well illustrated 48-page brochure entitled "A Preview" has recently been issued by the Worthington Pump & Machinery Corp., Harrison, N. J., and displays not only the current combined Worthington-Ransome lines of construction equipment, but also presents several new types of equipment under development for production after the war. All products will carry the Blue Brute trade name and, with Worthington's line of portable air compressors, rock drills, and air tools, and the line of Ransome concrete machinery, recently acquired by this company, will offer broad equipment coverage of the construction field.

C. F. Oechsle, Assistant Vice President, has been placed in charge of the Worthington-Ransome construction-equipment sales organization, with headquarters at Holyoke, Mass., and will be assisted by W. F. Lockhardt, Sales Manager of Ransome Machinery Co., Dunellen, N. J., and W. J. Fleming, Field Sales Manager, located at Holyoke.

Five regional offices located in New York City, Washington, D. C., Cleveland, Chicago, and San Francisco will afford nation-wide service to the construction industry.

Paper is vital to Victory. Save it.

ALL OVER THE WORLD
TORO
POWER MOWERS
TORO MANUFACTURING CORP'N.
MINNEAPOLIS, MINN.
MOWING MACHINERY SPECIALISTS FOR OVER 20 YEARS

LIKE A CHAMPION SKIER . . .

FORM-SET ROPE IS *relaxed*

He races down the hillside, quickly gathering speed. Almost nonchalantly, the skier does his turn at a breakneck pace as plumes of feathered snow swirl up and away. He's graceful, effortless, sure . . . because he's *relaxed.*

There's a great deal of that same relaxed quality in Form-Set rope. Form-Set is Bethlehem's preformed, and wire rope in the preformed construction has been relieved of many internal stresses and strains; freed of the locked-in tension that sometimes shortens rope life.

The helical wires don't have a nervous urge to straighten themselves out. Cut a section of Form-Set rope and see what happens. *Nothing.* The wires and strands lie just as they were. They don't pop loose or "wicker."

What's all this add up to? First, longer life (savings for *you*). Second, easy handling (something your *crews* will like). Third, better performance (and that's what everybody wants).

There's real dollar value in Bethlehem Form-Set. On scores of applications subjecting the lines to serious bending fatigue, the preforming process actually adds rope life. This saves you money in the long run. Why not prove it to your own satisfaction with a trial length of Form-Set*—the rope that's *relaxed?*

**All grades, constructions, and sizes of Bethlehem Wire Rope can be supplied with the Form-Set feature.*

BETHLEHEM STEEL

When you think WIRE ROPE . . . think BETHLEHEM

Arthur A. Johnson, New York Contractor

(*Continued from page 9*)

crete piers supporting steel I-beams, which in turn carried the weight of the elevated structure, for this load could not be transferred to the subway roof. Despite this delicate foundation work, not a train was delayed because of any construction operations.

War Construction

Besides tunnels, subways, dams, foundations, heavy grading, bridges, airports, caissons, etc., in civil operations, the Johnson corporation has been occupied the past few years with military construction.

"Naturally we still are not permitted to talk about the details of such construction," Mr. Johnson cautioned, "but I can mention that at the Brooklyn Navy Yard we built a cofferdam in the East River with underground salt-water conduits connecting the power house with the inlet structure. A much larger project was the Letterkenny Arsenal, Chambersburg, Penna., for the United States Army which involved the construction of 800 igloos, consuming over 200,000 cubic yards of concrete, with about 100 miles of paved highways, all of which was completed in the contract time of 200 calendar days, for the lump sum of approximately $8,500,000.

"The most important war project, however, was the construction of the Bermuda Army Base at a cost of over $35,000,000. The Army selected this company together with two other contractors, the Necaro Co. of Brooklyn and the Vermilya-Brown Co. of New York for this project. The Necaro Co. is another old subway contracting outfit, while Vermilya-Brown Co. is the successor of the Marc Eidlitz Co., once known as the 'Tiffany of Builders'. This name was acquired through its policy of custom building, that is, by carrying out the construction of the building as the representative of the owner, by which method this company achieved such an enviable reputation for economy and expedition that it has been called upon to produce buildings for more than three generations of the same owner. Work was started in Bermuda in March, 1941, and the base was completed within two years. We received commendations from the War Department for the efficient completion of these projects. The entire Bermuda project was under the supervision of Albert D. Saunders, Vice President of the Johnson corporation, to whom must be given full credit for the success of the operation.

"No great engineering or construction problems were involved in these war projects," said Mr. Johnson. "The most important factor was having a construction outfit organized for speed in order to complete the jobs as quickly as possible.

"In Bermuda our greatest problem was the absence of labor. Unlike other locations, such as Trinidad, where native labor is plentiful, we had to import most of our workers who numbered 5,000 at the peak of construction. We had to feed and house them, which meant setting up tents at first, and then building barracks. Our kitchens had as fine a set of ovens as the Waldorf Astoria, I daresay, and we had to prepare 15,000 meals a day. All food and even drinking water had to be brought to the island by boat for there is no source of fresh water on these coral reefs.

Albany Night Boat

"We were greatly aided in this housing situation by acquiring the steamer Berkshire, Queen of the Albany Night Line, which had led a romantic existence plying the Hudson between New York and Albany. We built another hull around this river boat to make it seaworthy, and then had it towed to Bermuda by an ocean-going tug of the Eugene Moran Towing Co. Condensers already installed on the boat provided fresh water and lightened the burden of shipping drinking water to the island. The staterooms were redesigned so that the ship, which was moored to a dock during the period of construction, could accommodate 800 men on board. At the completion of the base, the Berkshire, which was now owned by the Army, was towed to Norfolk, Va., and there broken up. The expense of purchasing, fitting out, and towing the Berkshire to Bermuda for use as a house boat was less than erecting barracks to house a comparable number of construction workers."

Other Interests

In 1929 the Johnson corporation ventured into a new field with the purchase of the controlling interest in the McEverlast Co., manufacturing originator of synthetic materials for concrete curing. This company was later reorganized as the Johnson-March Corp., manufacturer of industrial chemical products, with offices at 52 Vanderbilt Ave., New York City, and a laboratory and manufacturing plant in Long Island City. The company now manufactures industrial chemicals and, while one of its principal products is for dust treating of coal and reducing dust hazards in mines, it is now fully equipped and is manufacturing industrial chemicals and selling in bulk to the distributor.

A more recent acquisition was the 40-year-old A. M. Hazel Co., New York

(*Continued on next page*)

CUMMER
ASPHALT PLANTS
EIGHT SIZES
Up to 1000 Tons per day.
DRYERS
Two-Fire and Internal Fire
30 to 100 Tons per hour
Electric Batch Timers
50 Years' Experience
THE F. D. CUMMER & SON CO.
EAST 17th & EUCLID
CLEVELAND 15, OHIO

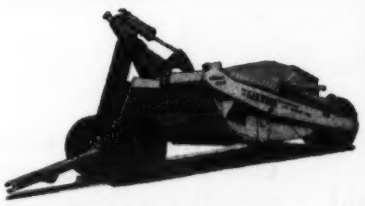
GAR WOOD ROAD MACHINERY

CABLE DOZECASTERS with angling blade for Allis-Chalmers HD-10 and HD-14 Tractors

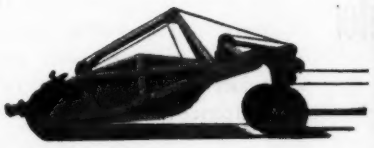
STAYS ON THE JOB

GAR WOOD GW ROAD MACHINERY TRADE MARK

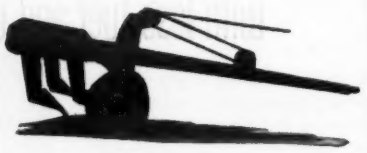
Gar Wood Industries, Inc., manufactures a complete line of heavy-duty earth-moving machinery • • • 2-wheel Scrapers, 4-wheel Scrapers, Bulldozers, Roadbuilders, Dozecasters, Rippers, Tamping Rollers and Cable Control Units. When anticipating your earth-moving equipment needs, be sure to investigate this modern well-constructed line. Your Allis-Chalmers Industrial Tractor Dealer will be happy to point out the features that make Gar Wood Road Machinery outstanding in the earth-moving equipment field. Get the maximum in performance with a minimum of "down time" • • • buy *GAR WOOD.*



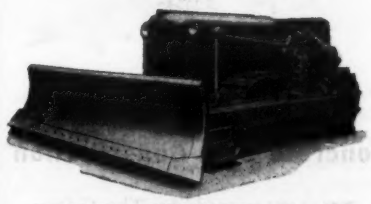
4-WHEEL HYDRAULIC SCRAPERS
Capacities: 8-10-15 cu. yds.



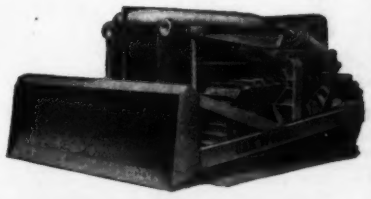
4-WHEEL CABLE SCRAPERS
Capacities: 11-15-20-25 cu. yds.



HEAVY DUTY RIPPERS
Cable and hydraulic operation



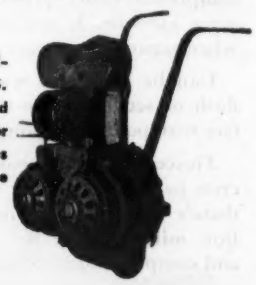
HYDRAULIC ROADBUILDERS with angling blade. For all Allis-Chalmers Tractors



HYDRAULIC BULLDOZERS with fixed blade. For all Allis-Chalmers Tractors

2-WHEEL HYDRAULIC SCRAPERS
Capacities: 3-5-6-8 cu. yds.

CABLE CONTROL UNITS. Double and single drum for 'most all makes of track-type tractors



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ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
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OTHER PRODUCTS OF GAR WOOD INDUSTRIES INCLUDE HOISTS AND BODIES • WINCHES AND CRANES • TANKS • HEATING EQUIPMENT • MOTOR BOATS

Arthur A. Johnson, New York Contractor

(*Continued from preceding page*)

waterfront and dock building contractor. Interest in this company was bought outright in June, 1944. Although it is still an independent organization with a separate entity, its officers are also officials of the controlling company. Albert D. Saunders, Vice President of The Arthur A. Johnson Corp., is now President of the A. M. Hazel Co.

"As far as present work goes, we are practically at a standstill", Mr. Johnson admitted. "We have recently submitted bids on some jobs but we were not low enough to get the contract. Frankly I think the prices contractors are bidding these days are suicidal. Labor is extremely scarce, especially in the unskilled ranks. The common laborer has all but disappeared. Since the war, he has been acquiring new skills and has been upgraded in industry with the result that the ordinary laboring jobs on a construction project have no appeal for him.

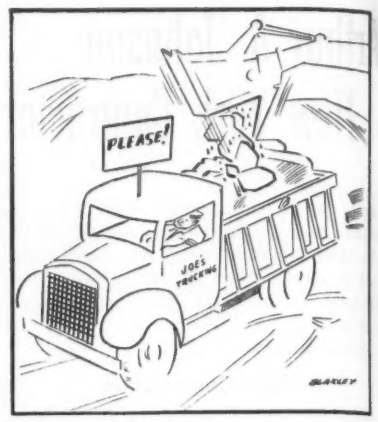
"I do not look for any great upsurge in the contracting business until after the end of the European phase of the war. Then I feel that contractors who have kept their capital and organization intact will be extremely busy. We maintain a nucleus of an engineering staff for the preparation of bids, and also retain a few key general superintendents who do odd jobs around the yard while marking time between contracts."

Civic-Minded Citizen

Mr. Johnson lives with his wife at Manhasset, in Nassau County, on the fashionable North Shore of Long Island. One of his sons, 40-year-old Richard A. Johnson, is now Vice President of the company, while the other son, Edward G. Johnson, 37, is a Captain in the Army Air Force. Although he protests that "my only hobby is my business", Arthur A. Johnson is appointed to so many committees that it has developed into a full grown hobby by itself. He is as well known for his interest in civic affairs as he is for his integrity as a contractor.

"Whenever a committee is organized these days, it seems that I automatically find myself a member," Mr. Johnson asserted with a faint chuckle. "I am Chairman of the Post-War Public Works Committee of the General Contractors Association of New York which has broken down the $1,000,000,000 post-war construction program which New York City is preparing to undertake after the war into man-hours, also into supervisory and equipment costs. Thus we can tell exactly how many jobs will be provided by a certain project. By such planning, returning veterans and war workers can be assured of jobs when peace comes. Lack of planning prolonged the last depression, but this time we are hoping to avoid the leaf-raking of the WPA by having all work done by contract."

Other committees with which Mr. Johnson is associated include the Committee of Fifteen whose duty is to examine into the finances of New York City with a view to securing a self-sustaining fare on the New York City transit system. He was also appointed by Mayor F. H. LaGuardia to membership on the New York City Post-War Industrial Committee of which the Mayor is Chairman, and likewise belongs to the Mayor's Business Advisory Committee. He has served as Director of the Metropolitan Section of the American Society of Civil Engineers of which he is a life



member, and was chairman of a committee to report on the advisability of unionizing professional engineers. On this somewhat delicate subject Mr. Johnson takes a forthright stand:

"The interests of professional men were neglected when the National Labor

(*Concluded on next page*)

For

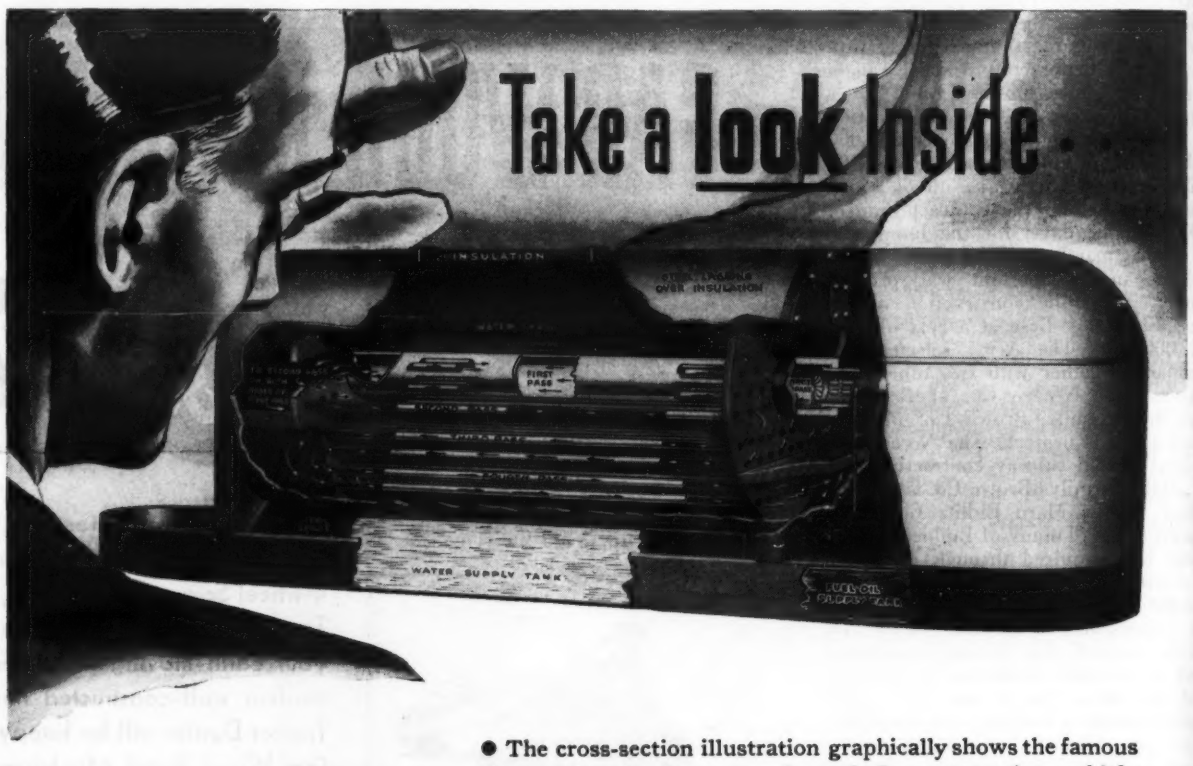
Highway and General Concrete Slab Construction

FLEXCELL, made by The Celotex Corporation, is the modern *approved* expansion joint that compresses under pressure but *never extrudes*. It springs back when expansion pressure is eased.

Can be used two ways—set flush or set below the slab surface with poured capping.

Flexcell helps to make concrete paving last longer because there's "never a bump in a million miles." Write for sample and complete information.

THE CELOTEX CORPORATION
Dept. CEM 4, Chicago 3, Illinois
World's Largest Manufacturers of
BITUMINOUS FIBRE EXPANSION JOINT



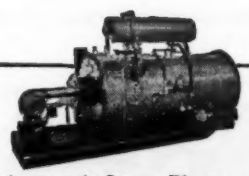
. . to see why you get hot, dry steam faster with less fuel and water

● The cross-section illustration graphically shows the famous Cleaver-Brooks four-pass down-draft construction which, with integral oil-burner, accounts for the remarkable efficiency of Cleaver-Brooks steam generating equipment.

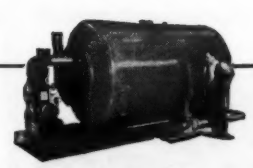
This construction doubles the lineal gas travel, compared to ordinary two-pass boilers,—the result is unmatched high heat transfer and efficiency.

No other equipment has this original and exclusive four-pass down-draft construction—plus the perfected positive dry coil method of condensate return—that's why you get hot, dry steam faster with less fuel and water with Cleaver-Brooks equipment. Write for bulletins and complete information.

CLEAVER-BROOKS COMPANY
5110 N. 33rd Street • Milwaukee 9, Wisconsin



Automatic Steam Plants
Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes from 20 to 500 h.p.; pressures 15 to 200 lbs.



Hot Water Boosters
Oil-fired; fully automatic or manual operation; no licensed engineer needed; two capacity sizes: 3000 gals. storage tank for 1600 gals. of water heated 150° F. per hour; 1500 gals. storage tank for 800 gals. of water heated 150° F. per hour.

Portable Pumping Boosters
Heats bituminous material by direct firing in one operation, loading directly to distributor, relay truck or returning to tank car. Two sizes, truck mounting or 4-wheel trailer.

Portable Tank-Car Heaters
Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure — no water or heat loss. Provides a portable source of steam wherever needed.

Cleaver-Brooks

Pioneers and Originators of ★TANK CAR HEATERS ★BITUMINOUS BOOSTERS ★AUTOMATIC STEAM-PLANTS

Arthur A. Johnson, New York Contractor

(*Continued from preceding page*)

Relations Act became law. Of course professional engineers should have the right to organize to protect their interests, but that should be done through a professional organization of their own, always maintaining the ethics of their profession, and not forced to become a part of a labor organization whose views and aims may be very different from those of the professional engineer."

Labor and its problems are an old story to this veteran contractor. Back in 1928 when he was President of the General Contractors Association of New York, Mr. Johnson became cognizant of a trend towards unionization of employees in the construction industry. Until that time only the skilled building trades were organized, but in 1929 when Mr. Johnson became Chairman of the Labor Committee of the GCA he negotiated the first agreement in New York City with labor in the heavy-construction industry.

He is also Chairman of the Engineering Committee of a citizens' committee to look into the possibility of building a mid-town Manhattan underpass connecting the East River tunnel with the Lincoln tunnel under the Hudson, and feels that a vehicular tunnel should be driven across Manhattan so that vehicles can go from New Jersey to Long Island without having to stem heavy New York City traffic.

In the subject of zoning, Mr. Johnson also takes a great interest. He is a member of a Steering Committee of Seven of the Citizens' Zoning Committee of New York to investigate and make recommendations regarding the City Planning Commission's amendment to existing zoning laws, particularly where the proposed restrictions might be a detriment to rebuilding congested areas.

Merited Awards

This versatile builder was President of the General Contractors Association of New York for the years 1928 and 1929, and in 1939 he was elected to the presidency of the Chamber of Commerce of the Borough of Queens, and was re-elected for four years in succession. When he finally relinquished that post last year, he was given a testimonial dinner at the Commodore Hotel with 1,000 well wishers present. One wall of his office is covered with plaques and certificates, for his activities in civic affairs and construction circles have brought Arthur A. Johnson well merited recognition.

The Moles, an organization of tunnel and heavy-construction men, awarded Arthur A. Johnson a bronze plaque in 1944 "for outstanding achievement in construction with the admiration and esteem of men engaged in construction", and this year he was elected President of the organization.

The public career of this contractor is attested by numerous photographs hanging on the wall, showing Mr. Johnson at public functions with prominent politicians like Jim Farley and other national, state, and city leaders. One of the most valued remembrances on the wall is a large photograph of the late Patrick McGovern, whom Mr. Johnson reveres not only as one of the greatest individual contractors developed in this country, but as a warm personal friend. When Patrick McGovern died about 10 years ago he had under way, among other things, a $43,000,000 contract for the Board of Water Supply, New York City. But the pictures which probably give Arthur A. Johnson the greatest satisfaction are two oil paintings of simple pastoral scenes hanging behind his desk, and a Peter Graham etching on the opposite wall entitled "Moorland and Mist", showing shaggy Scotch cattle browsing mid the heather.

"A wedding gift from S. Pearson & Son," explained Mr. Johnson. "It is one of a pair; the other is home."

The simplicity and peaceful charm of the pictures reflect the temperament of their owner. While his adopted country has been kind to this veteran contractor, he in turn has been prolific with his talents and energy not only in building tunnels, dams, parks, subways, etc., so that living may be made easier for his fellow citizens, but, by taking a keen interest and active part in civic affairs, Arthur A. Johnson has proved himself to be a constructor of ideas as well as of public works.

Plans are being formulated by WPB to increase the production of channel black, a type of carbon black, by 175,000,000 pounds a year, in order to meet the needs of the expanded heavy-tire program. No substantial increase will be possible, however, until late in 1945 or early 1946.

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PLANES GROUNDED BY SNOWBOUND RUNWAYS
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LAST WINTER'S LESSON!
NEXT WINTER'S WARNING!

EQUIP WITH SPECIALIZED

WALTER SNOW FIGHTERS

... AND ORDER EARLY!

Every highway and airport official in the "snow belt" will agree that the big lesson hammered home by last winter's record blizzards, is this: *The surest safeguard against costly, crippling snows is to be adequately equipped with the most modern, powerful snow-fighting equipment.* And right now is the time to benefit from that lesson, when early action can insure delivery for the coming winter.

Send today for the facts on Walter Snow Fighters. Learn how these rugged units are specially engineered and constructed for one, tough job . . . SNOW REMOVAL. Learn why they clear more miles per hour—why they cut snow removal costs—why they keep driving ahead under conditions that stop any other truck. Prompt planning now, means better protection next winter.

WALTER MOTOR TRUCK COMPANY

1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N.Y.

American Hoist & Derrick Names Seven Distributors

New distributors in various sections of the country have been appointed by the American Hoist & Derrick Co., St. Paul, Minn., to handle American derricks, hoists, and derrick fittings.

They are: Smith-Courtney Co., 7th & Bainbridge Sts., Richmond 11, Va., for southern and eastern Virginia; Carroll, Edwards & Co., 6508 Montgomery Road, Cincinnati, Ohio, for Cincinnati and the surrounding territory in Ohio, Indiana, and Kentucky; Andrews Equipment Service, N. W. Broadway & Flanders, Portland 9, Ore., whose territory is the state of Oregon; Harron-Rickard & McCone Co. of Southern California, 3850 Santa Fe Ave., Los Angeles 11, Calif., to cover southern California; Banks-Miller Supply Co., 742 Third Ave., Huntington 6, W. Va., for that city and the surrounding territory in West Virginia, Ohio, Kentucky, and Virginia; Contractors' Equipment & Supply Co., Springer Bldg., Albuquerque, N. M., for the state of New Mexico; and Tractor & Machinery Co., 351-355 Whitehall St., S. W., Atlanta 3, Ga., covering the entire state.

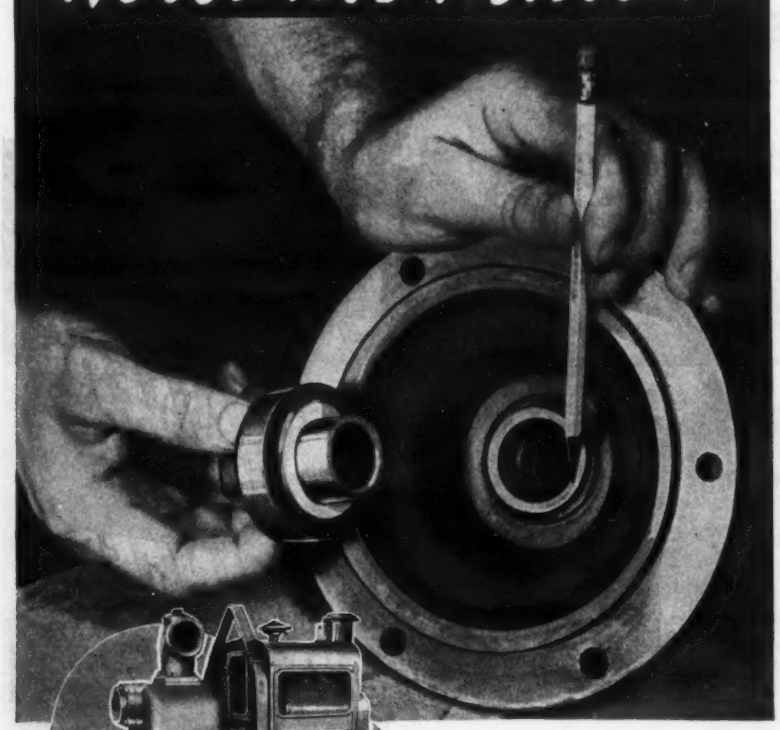
Adjustable Triangle Speeds All Drafting

In a new small folder, Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill., illustrates the many ways its new adjustable triangle No. 2598A can be used to speed drafting and still insure accuracy. The triangle is the equivalent of many different triangles and a protractor as well.

Made of heavy, transparent plastic with molded-in calibrations of half degrees, this adjustable triangle can be used for all kinds of layout work, for drawing screw threads, helical springs, bevel gears, and for any type of drawing requiring an angle from zero to 90 degrees.

Engineers and draftsmen interested in this moderately priced adjustable triangle should write direct to Bruning for folder No. A and mention this item.

Here's the Reason-



for their lasting performance

● The seal that keeps the water in and the air out consists of two wearing surface seal rings made of Tungsten Carbide and a grease container. One seal ring rotates on the shaft and is held in contact with the stationary ring by a stainless steel spring. This method of sealing is specially suited for high pressure work and when handling dirty water—the higher the pressure the tighter the seal. Dirty water cannot get into the grease and damage the shaft and bearings. Air is kept out of the pump so there's no loss of vacuum and high priming efficiency is maintained.

For details, see your local Carver distributor or write direct.

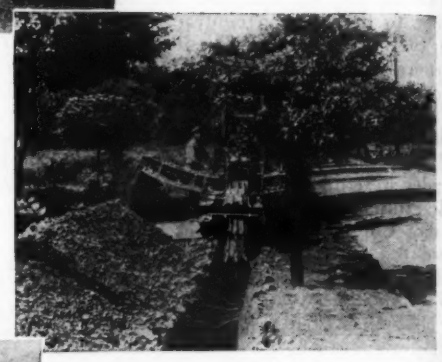
THE CARVER PUMP CO., Muscatine, Iowa

CARVER CENTRIFUGAL Certified PUMPS

DEPENDABILITY

Another "CLEVELAND" Characteristic—

Because of their correct design and superior Quality Construction insuring ruggedness, strength, stamina and power "CLEVELANDS" can be DEPENDED on to carry through on the toughest jobs, as demonstrated in the illustration at left.



Because of their compactness, absence of bulk and dead weight, their quick shift conveyor and full crawler mounting "CLEVELANDS" can be DEPENDED on to overcome quickly the many handicaps encountered in digging Trench in congested areas. Note in illustration at right how "CLEVELANDS" travel along the tree lawn and sidewalk without damage and how easily the conveyor can be positioned to pass trees, poles or other obstacles.

"CLEVELANDS" because of their large number and wide range of speeds, their ease of mobility (truck or trailer) and their unsurpassed maneuverability can be DEPENDED on to get to the job and get the job done FASTER.

"CLEVELANDS" are backed by a DEPENDABLE Parts Service, so important to all machinery users. CLEVELANDS awareness of this vital service is shown by its maintenance of unexcelled parts service under present war conditions.

You can DEPEND on "CLEVELANDS" too, to maintain its leadership in the Trenching Machine Field in the post-war era.

THE CLEVELAND TRENCHER COMPANY
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"CLEVELANDS" Save More . . . Because they Do More

Safe, Reliable Couplings . . . for Every Air Hose Service!

"AIR KING"

Quick-Acting, Universal Type

AIR HOSE COUPLING

With Auxiliary Locking Arrangement

A quick-acting coupling with a reputation for efficiency and safety on all types of pneumatic tools. Locking heads are identical for all sizes of hose and threaded pipe ends, permitting coupling of any two sizes of hose, or hose to pipe, within the "Air King" size range, without adapters, bushings or extra fittings.

Shanks of the "Air King" hose ends are longamply corrugated and smoothly finished, permitting easy insertion in the hose and providing a tight grip under clamp pressure.

A special locking arrangement, for services of a hazardous nature or those involving excessive vibration, makes it impossible for the coupling to come apart until manually released.

Sizes: Hose Ends—3/8", 1/2", 5/8", 3/4" and 1"; Pipe Ends—1/4", 3/8", 1/2", 3/4" and 1".

★ ★ ★

"DIX-LOCK" Quick-Acting Air Hose Coupling—with removable sleeve and spring.

"G J-BOSS" Ground Joint Air Hammer Coupling. Washerless. For heavied duty. Furnished with strong "Boss" Interlocking Clamp.

"BOSS" Washer Type Air Hammer Coupling. Same efficient clamp as "GJ-Boss."

"G J-DIXON" Ground Joint Air Hammer Coupling. Washerless. For all general service.

"DIXON" Washer Type Air Hammer Coupling. Interchangeable with other standard makes.

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Air-Entraining Cement For Wisconsin Paving

Exposure for Two Winters Showed No Scaling So Later Contract Called For Its Use; Removal of Old Paving And Construction of Storm Sewer

✦ THE construction of a concrete pavement in the city of Cudahy, Milwaukee County, Wis., in the spring of 1942, provided an excellent opportunity to compare the scale-resisting properties of air-entraining-cement concrete with those of standard portland-cement concrete. The results led the State Highway Commission of Wisconsin to award a contract in June, 1944, for the construction of a mile of concrete pavement, 9 inches thick and 46 and 54 feet wide, on State Trunk Highway 62 in South Milwaukee, with the use of air-entraining cement required.

The 1942 concrete-paving contract was on Packard Avenue in the city of Cudahy not far from the site of the 1944 job. To minimize interference with the wartime plant expansion of the Ladish Drop Forge Co. and permit earlier access to the Ladish plant, three 10 x 30-foot sections of concrete were laid, using high-early-strength cement instead of air-entraining cement. Immediately adjacent to these slabs the remainder of the pavement was placed with no change except the use of air-entraining cement.

After the first winter's ice-control treatment with sand and calcium chloride, the difference became noticeable and after the second winter's use was visible to all. The slabs poured with air-entraining cement were as smooth and unmarked as when first finished, while the slabs in which it was not used showed serious surface scaling and extensive exposure of the aggregates.

Old Pavement Removed

An old bituminous pavement on a concrete base was in place for most of the length to be repaved under the 1944 contract, so the first operation was the removal of the old pavement, which amounted to 25,752 square yards, plus 161 linear feet of old curb and gutter and 1,274 square yards of concrete sidewalk. An Allis-Chalmers K tractor equipped with a bulldozer rooted up the bituminous surface. The concrete base was then broken by a Lorain 1¼-yard shovel using a 2,800-pound steel ball as a drop hammer. While the ball was being used, the dipper stick and bucket were chained back to the shovel boom and the drop ball handled by the bucket lift line.

One shovel was engaged continuously in this pavement-breaking operation, assisted for the first week by a second, used in a similar manner. Another Lorain 1¼-yard shovel loaded the broken concrete and the bituminous material, which had been piled by the bulldozer, into six 5-cubic-yard Sterling trucks for hauling to the waste areas located ¼ and 1 mile away. Progress of this work averaged 1,400 to 1,600 square yards of pavement removed per 10-hour day.

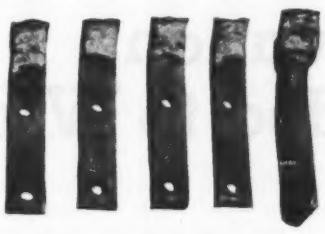
Storm Sewers

Work preliminary to the paving included the installation of 9,920 feet of concrete storm-sewer pipe in sizes from 8 to 33 inches. The specifications required that the installation be carried on concurrently by at least three complete outfits in order to eliminate possible delay in the completion of the project. In accordance with this requirement, two Northwest 1¼-yard and a P&H 1¼-yard crane with clamshells handled the excavation, augmented by hand crews on the short lines connecting the catch basins to the mains.

Grade boards were rapidly set by clamping 1 x 4-inch boards to ¼ x 2-inch steel posts driven on each side of the trench. All excavated material was wasted and the trenches backfilled with sand-gravel, a total of 741 cubic yards. Pipe too heavy for efficient hand placing was lowered from a wooden tripod by a line from a Beebe hand-operated hoist attached to one of the legs. Sand-gravel backfill was jetted until inundated; then any depressions resulting from settlement were re-backfilled until flooding caused no further settlement. The cost of this was included in the price bid for the sand-gravel fill.

Personnel

The contract for this work was awarded to Kramp Construction Co., Milwaukee, Wis., on June 27, 1944, by the State Highway Commission of Wisconsin. Removal of the old pavement was done by the Scherkenbach Construction Co. of Milwaukee under a subcontract. J. E. Meier was Resident Engineer for the Wisconsin State Highway Commission, of which E. L. Roettiger is State Highway Engineer and A. T. Bleck is Construction Engineer.



When Digger Teeth were Hard-Faced with Coast Metals

$11.52 A MILE SAVED

When one mid-western construction company changed to Coast Metals for hard-facing the teeth of its digger bucket, it reported several noteworthy economies. The teeth showed greater wear-resistance. So much so that re-facing was necessary only every six miles instead of every three miles as formerly required. This saving amounted to $11.52 a mile.

By making dipper teeth, grader blades, rolls and hammers in crushing equipment, tamps on sheepsfoot rollers and other parts exceptionally resistant to abrasion, impact and wear, Coast Metals Hard-Facing lengthens equipment life several times. It is readily applied by the acetylene welding torch or electric arc *to any ferrous metal.* Write us for the correct rod to solve *your* problem.

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COAST METALS hard-facing weld rods
MAKE YOUR EQUIPMENT LAST LONGER

GAR WOOD EQUIPMENT
FIGHTING ON EVERY FRONT

Material handling Crane. Signal Corps Photo
Cable Bulldozer.
Hi-Lift Cargo Plane Loader. © International News Photo Service
Giant Truck Body with automatic downfold tailgate.
Telescopic Hydraulic Hoist.

Somewhere off in the far Pacific . . . on the hard fought battlefields of Europe . . . in Asia . . . Africa . . . anywhere, you name it . . . that's where Gar Wood equipment is serving Allied Forces in a hundred different ways. Famed Bulldozers with a colorful history, earth-moving Scrapers, tireless Winches, Wrecker Cranes, Hi-Lift Plane Loaders, Hydraulic Hoists, Dump Bodies, gasoline, oil and water Truck Tanks . . . these and many others are the wartime products of Gar Wood. Each of the six divisions of Gar Wood Industries, Inc. specializes in its field, and each division is busy producing the fighting equipment it knows best how to build.

When Victory has been won, Gar Wood Equipment will again be available for civilian use. All the experience accumulated in years of peacetime will be combined with new wartime developments to bring you better-than-ever Gar Wood Equipment.

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WORLD'S LARGEST MANUFACTURER OF TRUCK AND TRAILER EQUIPMENT
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Cable Conservation Still Needed to Win

Experience of Three Users Of Wire Rope Should Aid You in Stretching Your Cable to Victory

✦ ALTHOUGH we hope that the end of the war is now in sight, we know that the last foot of rope on the nation's spool of steel cable is. During the war emergency, users of wire rope, individually and collectively, have done much to extend the normal working life of steel cable through field experimentation with rope operation and maintenance. A continuation of this conservation program is particularly vital now, as we buckle down to the last tough stretch to final victory.

Starting with a series of suggestions from dealers and manufacturers, rope consumers during the war years have solved operational problems with new methods which effectively conserve cable. Hundreds of rope users have developed and passed on to others worthwhile methods of maintaining and operating steel cable in manners which extend its life. Several helpful suggestions on specific methods by which steel cable may be conserved are contained in this article. Each user had a peculiar rope problem to solve, but all users of wire rope will find these solutions practical and beneficial.

Round-the-Clock Operation

An independent producer of iron ore in northern Minnesota uses large quantities of wire rope on power shovels, draglines, hoists, and, at two underground properties, in slusher operations. His problem was to keep his cable working round the clock under the strain and stress of high-speed heavy work.

This user had previously tried several types of wire rope on each of the operations, keeping an accurate record of the servicings, breaks, and replacements for each type of rope. From these records, he found that in each of four different operations, a preformed wire rope gave more continuous operation over longer periods of time and handled the work more safely than an ordinary type of wire rope. Accordingly, preformed wire rope was placed on all equipment for the various operations.

Having determined the type of wire rope which was best suited to his needs, this user set about further extending the working life of the cable by a program of on-the-spot conservation. After observations in the field and examinations of carefully maintained records, he found that in each of the four operations where steel cable was used, there was one or more measures of preventive maintenance which he could take.

Hoists. At regular intervals, the cable is removed from the hoist drums, a foot or two is cut from each end, and the drums rewound. This changes the location of points where the cable rides up to form a new layer of turns on the drum, lengthening the life of the rope by more evenly distributing wear.

Power Shovels. Cables are turned end for end at regular intervals. This accomplishes the same result as removing a foot or two from each end of hoisting cable and rewinding.

Draglines and Shovels. One of the principal problems in dragline and shovel operations is presented by the grit and abrasives which ride the rope back into the sheaves and drums. Lubrication, following a thorough cleaning of both sheaves and drums as well as the rope, at scheduled intervals prevents broken or rusted strands of wire and scored and pitted sheaves and drums.

On all operations, this mining concern follows a general pattern of inspection to conserve wire rope. All equipment is examined before new rope is wound, and is inspected at regular intervals thereafter to see that sheaves are aligned, that grooves are not cut or worn or rims broken, that journals are not worn or damaged, and that drum shafts have not become bent.

Switching ropes, end for end, makes for longer cable life.

Heavy Earth Moving

An earth-moving contractor in the west experienced difficulty in working with scrapers and bulldozers in a light sandy soil. What started as a routine check on maintenance methods on his job developed into an exhaustive examination of a disproportionate number of cable breaks and replacements. This was doubly puzzling to the contractor because he had recently installed preformed-type wire rope on all his equipment in a bid for smoother and more continuous operation.

This contractor discovered that, although the records showed regular servicings and lubrication of the scrapers and bulldozers, there was no record of wire-rope lubrications. When questioned, the maintenance superintendent admitted that a swipe over steel cable with an oily rag usually passed for lubrication. More patient than most men, the contractor explained that, although all types of wire rope, including preformed, are provided with an inner core lubrica-

(Concluded on next page)

NO. 25 OF A "READY-WITH-A-RODGERS" SERIES

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"Our Rodgers Universal Press services all kinds of heavy machinery. We use it for pulling gears, pushing out bushings, straightening shafts — wherever portable power comes in handy. It takes these jobs as they come—and they come often. A shop like ours would be hamstrung without the Rodgers."

This observation, and the photograph, came to us from Mr. A. Hovey-King, The Paving Supply and Equipment Company, Washington, D.C. It is typical of experiences reported to us by other Rodgers users. The Rodgers Universal Press supplies portable pressing, pulling, and lifting power—saves shop time, simplifies operations. Put it to work for *you*. For more detailed information and prices, write or wire Rodgers Hydraulic, Inc., 7415 Walker Street, St. Louis Park, Minneapolis 16, Minnesota.

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Cable Conservation Still Needed to Win

(Continued from preceding page)

tion at the time of their manufacture, this wears away with constant operation and so needs to be renewed regularly. He then issued the following memorandum, addressed to the superintendent and personally repeated to each serviceman:

"All wire rope on scrapers and 'dozers must be lubricated not only regularly, but *correctly*. On this project, correct lubrication will consist of the following steps:

"1. The entire length of wire rope will be cleaned thoroughly with kerosene and a wire brush before any lubrication is applied.

"2. A light-bodied lubricant will be applied to the rope with a fairly stiff paint brush, or will be poured from a can into a large swab held about the rope.

"3. Excessive lubricant will be wiped from the rope before it is placed in operation.

"4. This lubrication will be done at regular stated intervals and written records will be maintained.

"5. Servicemen will continue to inspect and clean drums and sheaves as in the past."

Within a month, cable breaks on this project had decreased 70 per cent. The contractor commented:

"In the field, on operations that are continuous, any wire rope is doomed to failure unless it is lubricated regularly and correctly."

Service in Gravel Pit

A gravel-pit operator in the midwest was troubled by rope fatigue. Although he expected long life and trouble-free service from the preformed steel cables he was using on his dragline and hoist, the rope simply played out long before it should. As he observed dragline operations one day, he noticed that the cable vibrated each time the bucket was filled and drawn in. He called his serviceman and they began an immediate examination of the clutch and brakes of the machine. The brakes were inclined to slip and the clutch chattered. Coupled with the somewhat hurried handling on the part of a rather inexperienced operator, this chattering of the clutch was magnified and telegraphed throughout the length of the rope. Whipping or vibration very quickly causes rope fatigue. Repair of the clutch and brakes and smoother handling of the dragline eliminated vibration and completely erased all record of fatigue of the cables used on the dragline.

This same operator, investigating further, discovered that the cause of rope failure on his hoisting equipment was improper spooling or winding on the drums. Only a fraction of the service expected was being delivered because the rope was carelessly permitted to crisscross on the drums. Several sections of the rope had literally been crushed to death.

The operator of this pit then had a talk with his men. The maintenance of wire rope, he explained, must start when

Frequent and careful inspection of wire rope pays real dividends in longer cable life and reduced machine shutdowns.

the spool arrives on the job. In winding rope on drums, turns must be started correctly so that the rope lies flat and the strands do not cross each other. Right-lay rope must be started from the right flange of the drum, as it is faced from the rope side, and left-lay rope from the left side.

Wire-rope performance on his hoisting equipment, after the cable was correctly spooled, was increased almost 100 per cent.

Correct Care the Answer

The experiences of these three individual and distinctly different users of wire rope might be multiplied many hundred times. The solution to your own wire-rope problems may be as simple as any of these. Select the rope best suited to your purpose. Then watch the maintenance and operation which you are giving the rope. Correct and regular maintenance and proper operation are the answer to almost any wire-rope problem.

Are your employees taking full advantage of the Payroll Savings Plan for the purchase of War Bonds? You can aid the war effort by reminding them of this systematic method of hastening the day of Victory.

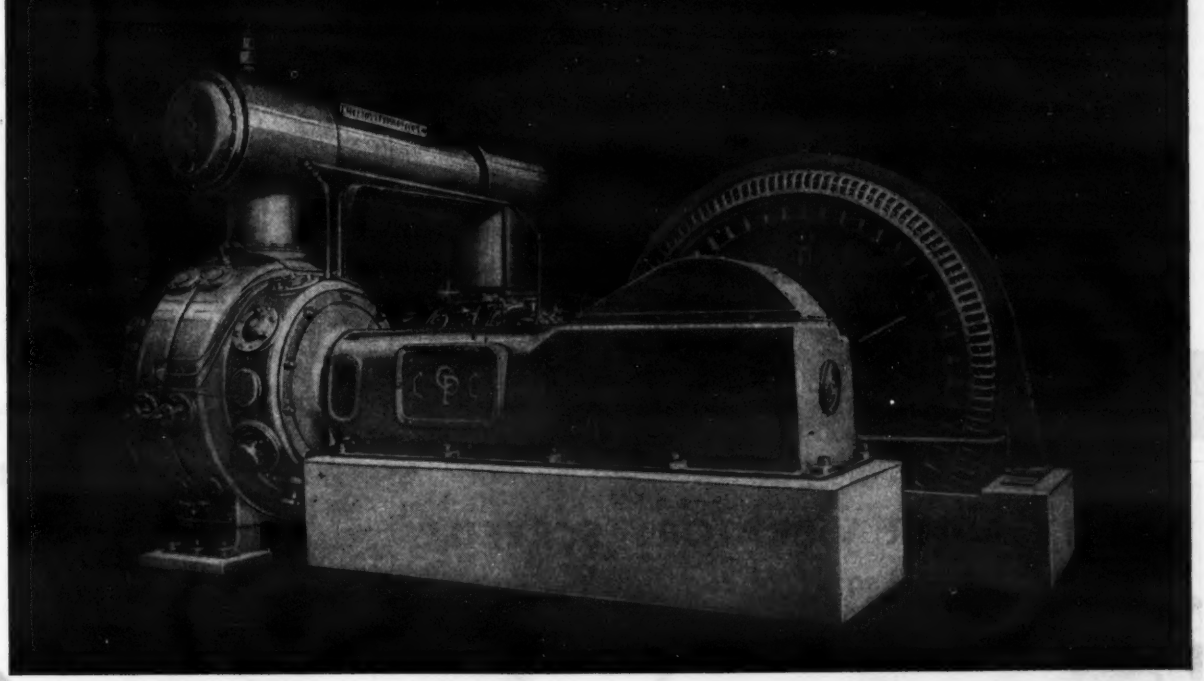
Unit Electrical Plant For Field Service

Electric plants ranging from a 1-cylinder 250-watt model through 185 models to a 6-cylinder 25-kw machine are available for contractors, emergency crews of highway departments, and for other field service. These Universal Matched Unit electric plants, made by Universal Motor Co., Oshkosh, Wis., are easy to install either for portable or permanent service, they start automatically at the turn of a switch, have no exposed moving parts, and maintain the correct motor speed automatically by means of a governor. According to the manufacturer, the only servicing required is the adding of fuel and lubricating oil with regular oil changes. The generators are large size for the rated output of each unit and are direct-connected to the engine shaft.

Complete information on any or all of the sizes listed above may be secured from the manufacturer by mentioning this news item.

For 68 Years Builders of Fine WHEEL BARROWS:
AMERICAN
STEEL SCRAPER CO.
Sidney, Ohio
Watch for Post-War Models

Low Power Consumption



BUILT INTO CP CLASS O-CE COMPRESSOR

THE low power consumption of the heavy-duty Chicago Pneumatic Class O-CE Compressor is the result of large area, durable, quick-acting Simplate valves . . . streamlined air passages . . . multi-step capacity regulation . . . thoroughly effective intercooling and water jacketing and efficient lubrication.

CP Class O-CE Compressor is of the horizontal, double-acting, water-cooled type with direct-mounted synchronous motor drive. Capacities range from 350 c.f.m. to 10,000 c.f.m., 80 pounds to 125 pounds pressure. Other sizes available for lower and higher pressures and for other types of drive. Write for Bulletin 726.

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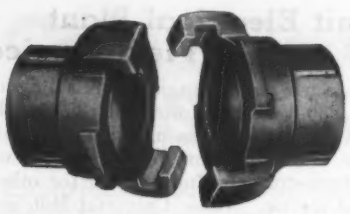

A Kelly Hy-Way coupler for air or water pipe or hose lines.

Speed in Two Ways In Hose Couplings

Malleable-iron hose couplings which are sturdy in design, quickly attached to the hose, and can make a water or gas-tight connection in fast time are being made by the Kelly Machinery Co., Hose Coupling Division, 2524 W. Madison St., Chicago 12, Ill. Kelly Hy-Way couplers are made in 1¼, 1½, and 2-inch sizes, with a new patented gasket design which eliminates the necessity of compressing a large amount of rubber when coupling up. This makes it possible for one man to connect the larger-size couplers without any tools.

The locking heads are of universal design, eliminating the usual male and female ends, so that any locking head can be coupled with any other locking head of its size. The 1¼ and 1½-inch sizes can be coupled together, but the 2-inch couplers interchange only with other 2-inch couplers.

Complete information on the various types of Kelly universal quick-acting hose couplings will be found in a 4-page folder which may be secured from the manufacturer by writing direct.

Belt Conveyors Handle Aggregate Economically

Because of the continuous nature of its operation, a belt conveyor has the capacity to meet tremendous requirements up to many thousands of tons an hour, E. A. Mathias, Goodyear Tire & Rubber Co., pointed out in a paper presented at the Materials Handling Machinery Manufacturers Conference recently held at the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Mr. Mathias stated, as an example, that a 72-inch belt conveyor handling 100 pounds of material at 600 fpm can deliver over 6,000 tons an hour. In terms of special trucks of 25-ton capacity, this means 240 trucks loaded, dispatched, and unloaded on the job every hour. In terms of standard-gage rail haul, 120 cars of 50-ton capacity would have to reach their destination and be unloaded every hour to equal the belt's 6,000-ton capacity.

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Portable Unit
4-Wheel Trailer
2-Wheel Trailer

There's an economical "U.S." unit for every construction-work need. Engineered by men with practical, out-in-the-field experience. Built to take every punishment — and operate faithfully for long continuous hours. Sizes from 500 watts to 15 KW. Skids, rings, porter bars, and trailer mountings available.

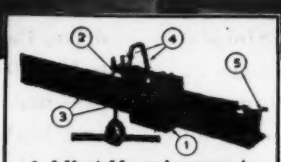
"U.S." BUILDS A COMPLETE LINE of Gasoline and Diesel Electric Plants up to 75 KW—for standby, continuous duty, battery-charging, and portable uses. Write for literature, stating type of unit and capacity required.

UNITED STATES MOTORS CORP.
554 Nebraska Street Oshkosh, Wisconsin
Factory representatives strategically located throughout U. S. A. and Canada.

"U.S." ELECTRIC PLANTS

NEW MASTER VIBRATORY SCREED

Places up to 6,000 sq. ft. of concrete per hour!



1. Adjustable spring mounted shoes
2. Two way draw
3. Easy adjustment for length
4. Yoke for lifting
5. Remote engine control

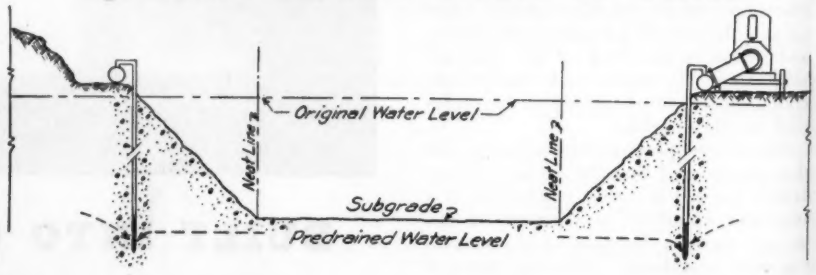
THIS new vibratory finishing screed makes possible accurate strike-off and compaction of concrete slabs in one easy operation. *No additional vibration or floating is required.* Saves time and manpower in placing floors, aprons, runways, roads and service areas. Models: VS-6 ft.; VS-10 ft.; VS-13 ft.; VS-16 ft.; VS-20 ft.; and VS-25 ft.; all models adjustable for length. Wider widths or special shape vibratory screeds to your requirements. All vibratory screeds powered by economical 1½ HP variable-speed gas engines including Master Automatic Clutch.

Write for Bulletin 596 for complete details.

MASTER VIBRATOR COMPANY
Dayton 1, Ohio • Distributors throughout United States and Canada
Products Include: Concrete Vibrators, Gas or Electric, Surfacing Attachments, High Speed Tools • Vibratory Concrete Finishing Screeds • Rotary Concrete Floor Finishing Machines • Portable Gas Electric Generator Plants, 500 Watt to 17000 Watt, Voltage Regulators and Portable Mountings Optional • Master Tunnel and Shovel Lights • Electric or Gas Engine Driven Power Plow Hammers

A Griffin Wellpoint Job!

Rapid Griffin Predraining Speeds Excavation in Sand



No Sheeting Needed on this job

This excavation for a municipal water supply was situated only a few yards from open harbor water. Sand was bulldozed across the dredged harbor to form a dike. The photo above shows the excavation 10 days after two Griffin Pumps started with Griffin Wellpoints at 4-foot intervals. Water level dropped 20 feet. Removal of water pressure allowed sand to repose naturally on a 1 to 1 slope; and excavation proceeded without delay. Dry YOUR next wet job for less—use GRIFFIN WELLPOINTS.

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FOR SALE — FOR RENT

MAIN OFFICE: 881 EAST 141st STREET, NEW YORK 54, N. Y.
GRIFFIN WELLPOINT CORPORATION

Maintenance Methods On Wyoming Highways

(*Continued from page* 12)

age.

Wide rights-of-way, from 150 to 300 feet, are secured and embankments are built on a 6:1 slope on all fills less than 3 feet in height, 2:1 slopes being used on the higher fills. In cut sections a 6:1 downward slope is carried for 6 feet horizontally from the edge of the roadway to form the shoulder and then flattened to a 20:1 slope to the back of the ditch. Cut backslopes are made variable so as to provide a straight line to the outside top of the slope but are never more than 1½ to 1 except in solid rock.

Although the frost line runs as deep as 6 feet, the porous, well drained soil of which most subgrades are composed and the low annual precipitation minimize the formation of frost boils, and the principal wartime maintenance operation has been the placing of new seal coats, preceded by some surface patching.

Road-Mixed Patching Material

For patching, a gravel meeting the following specifications is used:

Size (Square Opening)	Per Cent Passing
1-inch	100
¾-inch	75-100
No. 4	40-75
No. 10	30-60
No. 200	3-20

This gravel is frequently produced and stockpiled by contract, although the Highway Department owns three Austin-Western screening plants without crushers, built to the State's own design, with which they sometimes produce their own aggregates.

This aggregate is blade-mixed with about 5 per cent of MC-3 in convenient locations. Sometimes this is done in flat areas near a job or sometimes close to a shop or sub-shop. At the Lander shop this mixing is done by a Caterpillar No. 12 motor grader operating on a runway around an oval about 300 feet long and 100 feet wide. The aggregate is stockpiled under contract; state forces apply the asphalt and perform the mixing, after which the mixed material is bladed into a tight windrow and stored until needed.

When used, it is loaded by hand, or by mechanical loaders if the amount required justifies, is spread and raked by hand into the depressions to be patched, and rolled by the wheels of loaded trucks.

Sealing Operations

The general policy of the Wyoming Highway Department is to perform sealing jobs with state forces and it was planned so to equip and staff the maintenance organization that 1,000 miles could be sealed each year, thus assuring sealing of the entire 4,000 miles of bituminous roads in the state every four years. The war delayed the consummation of this plan, however, and a considerable mileage of seal-coat application has been performed by contract.

Sealing, whether done by state forces or contract, consists of the application of RC-2 or RC-3 in quantities varying from 0.27 to 0.33 gallon per square yard, covered by 20 pounds of chips meeting the following specifications for grading:

Size (Square Opening)	Per Cent Passing
⅝-inch	100
½-inch	95-100
No. 4	0-10
No. 10	0-5

An alternate procedure is the application of 0.22 gallon of RC-2 or RC-3 per square yard and a pit-run river-bar sand which has been run through a ¾-inch screen to eliminate the very small percentage of oversize present. This material is quite well graded and ordinarily contains 25 per cent passing a No. 10 sieve and about 5 per cent passing a No. 200. About 90 per cent passes a No. 4 sieve.

A state-force operation of this kind was completed near Worland in north-central Wyoming on U. S. 20 in October, 1944. Pit-run aggregate had been previously taken from river bars by small power shovels or mechanical loaders and stockpiled in the ditch at 2-mile intervals. A Nelson loader delivered the material from these stockpiles to Ford and Chevrolet dump trucks, the aggregate dropping off the horizontal conveyor at the top of the loader onto a ¾-inch screen suspended over the truck bed. The amount of oversize rejected by this screen was negligible and a 3-cubic-yard truck body was loaded in 3 to 4 minutes.

Asphalt for this particular operation was obtained from a refinery near Thermopolis and hauled in two insulated trailer trucks of 1,000 and 2,500-gallon capacity. Both trailers went to the refinery each morning and returned with asphalt loaded at a temperature of 200 degrees. The 1,000-gallon tank was used first and made a second round trip while the 2,500-gallon tank was being used. On the short haul of this operation no additional heating was required, although the Highway Department has Littleford retort heaters available for reheating at the job when necessary. However, it is reported that, by the use of insulated tanks, asphalt is sometimes hauled 300 miles with a temperature loss of only 25 degrees.

Distribution of the asphalt was by a trailer-mounted pump, pulled behind an International truck and pumping from the booster tank truck to a 10-foot spray bar. Spreading of the sand seal was done by a 10-foot Buckeye spreader box on a backing dump truck. Both asphalt and cover material were applied in half widths to alternate sides of the road, with the ends evened up at night.

Effect of Seepage

An interesting treatment to eliminate damage to a section of road near Dubois on U. S. 287 was under way at the same time. An irrigation canal constructed by the U. S. Bureau of Reclamation carried a considerable quantity of water along a hillside parallel to the road and some 200 feet away and 25 to 30 feet above it. This particular section of road had never presented any difficulties of maintenance prior to the construction of the canal but, by the second year after water had been introduced into the canal, serious deterioration of the surface of the highway developed.

Wing ditches were constructed lead-

(*Concluded on next page*)

VULCAN TOOLS

A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

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35-43 Liberty Street, Quincy, Mass.

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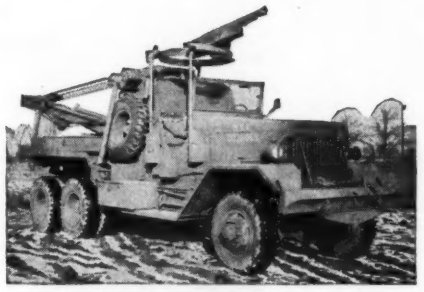
WHEN "BIG BOY" TAKES OFF HIS UNIFORM



● All over the world, where the going is toughest, the M1A1 Army heavy wrecker has earned its reputation as the biggest, toughest, pullin'-est bruiser on wheels. These super trucks, built by Ward LaFrance Truck Division for the Ordnance Department, are used for such jobs as tank recovery, motor vehicle rescue, lifting and carrying disabled bombers. They operate in the mire of European swamps . . . the muck of Asiatic jungles. To the M1A1 wrecker, a road is a convenience, rather than a necessity . . . In the near future, Ward LaFrance commercial trucks and tractors will again appear on America's highways. These Ward LaFrance over-the-road trucks and tractors are designed to haul pay loads faster and more economically than ever before. They are not streamlined like a sport coupe, but they look like what they are: the biggest, toughest, sturdiest motor trucks on the highway. They are backed by the twenty-five year Ward LaFrance reputation for building great trucks, further proved by unbeatable performance all over the world.

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TRUCK DIVISION
GREAT AMERICAN INDUSTRIES, INC.
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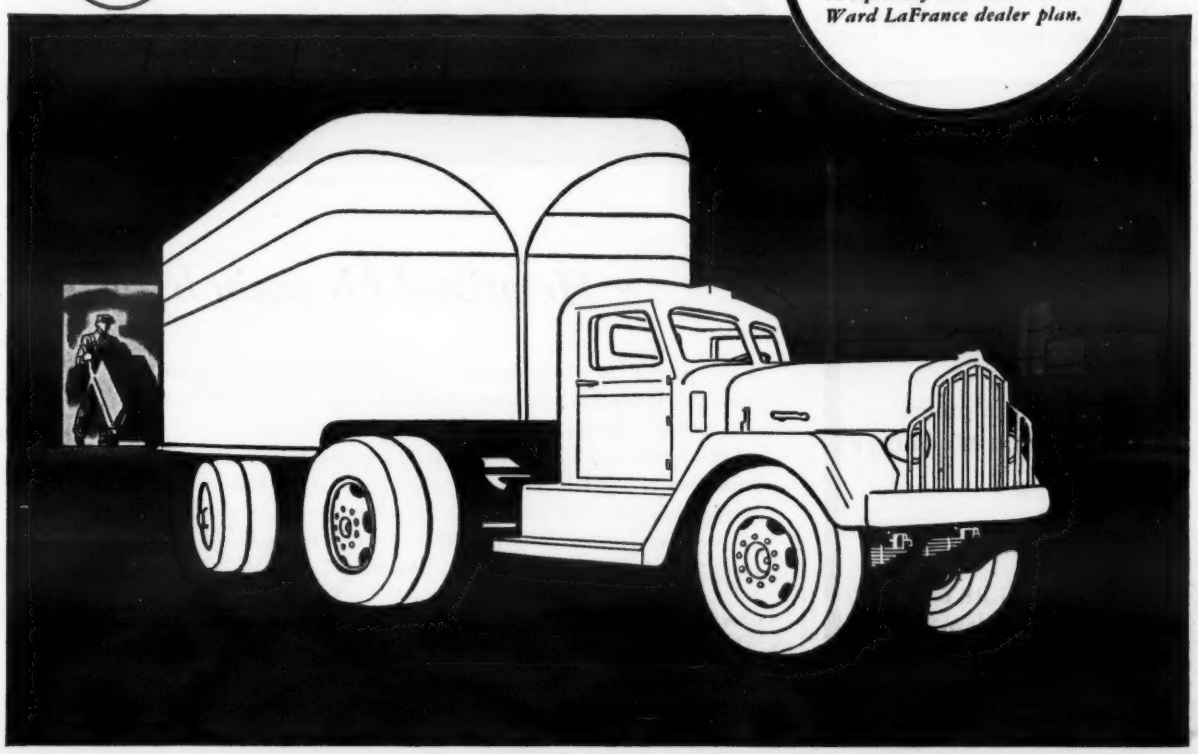
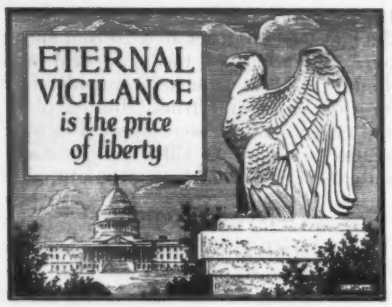
FRANCHISES ARE AVAILABLE *to alert dealers in a number of attractive territories. Leading dealers now handling smaller, non-competitive trucks will be especially interested in the Ward LaFrance dealer plan.*





Maintenance Methods On Wyoming Highways

(*Continued from preceding page*)

ing at an angle from the inlets of all culverts along the critical section into the hillside between the road and the canal. These ditches successfully intercepted ground-water seepage from the canal, conducted the water into the culverts for discharge on the low side of the road, and completely eliminated the trouble experienced from the infiltration of this water into the subgrade and the sub-base materials. It was reported that this was an isolated instance and that in other localities canals built adjacent to highways did not adversely affect their life.

Mowing

Because of the difficulties of obtaining repair parts for worn-out mowers, this operation has been materially reduced by the Wyoming Highway Department during the war. The general policy now is to mow the shoulders only twice during the summer. In the autumn, after the first frost has killed the weeds, the shoulders and an area for 6 feet down the slope are dragged with old grader blades pulled flat along the ground by chains from an arm extended from a truck. In areas where heavy winds are prevalent and serious snowdrifting occurs, this treatment is extended to cover the entire width of the right-of-way in order to eliminate the snow-fence-like effect of high weeds adjacent to the road.

Scoria for Aggregate

In the northeastern section of Wyoming, considerable quantities of scoria exist. Since this section of the state is rather deficient in gravels and limestone acceptable for base-course and bituminous-mat construction, attempts have been made to use this scoria for a substitute. Scoria, as it occurs in Wyoming, is a hard-baked clay almost vitrified by the heat from burning coal beds underlying it. It occurs in small hillocks usually having an opening near the center and it is near these chimneys that the material attains its maximum hardness, gradually becoming softer towards the outer edges of the deposits. The material has an average loss under the Los Angeles rattler test of 30 to 40 per cent although the harder material near the center of the deposit frequently loses as little as 20 per cent under this test. Attempts to use scoria, crushed to a 2½-inch maximum size, as a base material have proved unsatisfactory due to a deficiency of smaller sizes so that it has been necessary to add about 17 per cent of fines.

It has been found by experiment, however, that by crushing to a maximum size of 1 inch, this difficulty is overcome and the material has been quite satisfactory for use in bases, except that excessive quantities of water may be required for initial compaction. Materials Engineer I. E. Russell expresses the opinion that its use in base material might be still further improved by crushing to a maximum size of ¾ inch.

Wyoming has reluctantly abandoned the use of scoria as a material for mineral aggregate since its porous nature requires the use of such large quantities of asphalt as to make it uneconomical, despite the scarcity of other aggregates in the locality where the scoria is found. Using aggregates produced from limestone, which is found in the neighborhood and which has a Los Angeles rattler-test loss of 30 per cent, estimates are based on the use of 1½ gallons of liquid asphalt per square yard of mat 3 inches thick. Using scoria on certain jobs, 5 gallons of liquid asphalt have been introduced into the same quantity of aggregate and still proved insufficient. Mr. Russell believes that at least 13 per cent of liquid asphalt would be necessary to obtain an even partially satisfactory surfacing with the local scoria.

Personnel

Highway maintenance operations in the state of Wyoming are under the general central-office direction of J. R. Bromley, Superintendent, and W. E. Sutton, Division and Equipment Engineer. Detail supervision is exercised by the five District Maintenance Engineers, A. G. Gardner, Cheyenne; W. B. Schilling, Casper; Charles E. Gard, Lander; H. E. Langheldt, Sheridan; and R. C. Stapp, Rock Springs. The district boundaries are so established that each has approximately equal mileage under his supervision.

N. Y. Distributor Agency Organized by Jack Thorp

An agency for the sale of a number of well known lines of construction equipment in the metropolitan area and vicinity, to be known as The John N. Thorp Co., has been formed by Jack Thorp, with offices at 50 Church St., New York 7, N.Y. Mr. Thorp was formerly Manager of the Construction Equipment Division of the Chicago Pneumatic Tool Co. for eight years, and for twelve years prior to that was a special representative for the Railroad and Construction Department of the Ingersoll-Rand Co.

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and
EXTRACTORS
HOISTS—DERRICKS
WHIRLERS
Special Equipment
Movable Bridge Machinery
Write for descriptive catalogs
McKIERNAN-TERRY CORP.
19 Park Row, New York
Distributors in Principal Cities

Illustrated above — Curvex† Sentry, 17-jewel Precision movement, pink or yellow gold-filled case, $55.00 (Federal Tax included).

He missed his train by 1/10,000 of an inch

A tiny part of his watch movement was 1/10,000 of an inch off... result: his watch lost a fraction of a second. But what's a fraction of a second? Listen...It's a lost train...a lost contract... a lost appointment! Yes! 1/10,000 of an inch can be mighty important in a watch . . . That's why we at Gruen have never been satisfied with anything less than precision accuracy since 1874 . . . Remember, Gruen is the only watch in the world permitted to carry the trademark, "Precision"!

While we have been manufacturing large quantities of vital precision instruments for war, we also continue to produce fine Gruen Watches for civilian use . . . but of course the demand for these watches far exceeds production possibilities today.

BUY A GRUEN WATCH . . BUT BUY A WAR BOND FIRST

GRUEN
THE PRECISION WATCH

Gruen Watches from $29.75 to $250; with precious stones to $4,000. The Gruen Watch Company, Time Hill, Cincinnati, Ohio, U.S.A. In Canada: Toronto, Ont.

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GRUEN...THE PRECISION WATCH...AMERICA'S CHOICE FOR OVER 70 YEARS

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LeTourneau Names Miller Central Sales Manager

The promotion of H. E. "Cap" Miller from District Representative to Central Sales Manager with offices in Peoria, Ill., has been announced by R. G. LeTourneau, Inc. Mr. Miller joined LeTourneau in 1934 at its western office at Stockton, Calif., where he served as District Representative. Between 1937 and 1940 he headquartered in London, England, and introduced the LeTourneau earth-moving line to many European countries. Since returning from Europe, he has served as a District Representative for LeTourneau in the south and southwestern states.

In his new position, Mr. Miller will supervise the activities of LeTourneau District Representatives in approximately twenty middle-western states. His efforts will be coordinated with the work of Eastern and Western Sales Managers of the firm, all three of whom report to G. S. McKenty, General Sales Manager.

Mr. Miller is succeeding Howard L. Stilley, who left on March 15 to become General Manager of the Soule Equipment Co., exclusive northern California distributor for R. G. LeTourneau, Inc. His office will be at Oakland, Calif.

New B-G Distributors

Barber-Greene Co., Aurora, Ill., has announced the appointment of two new representatives of its Construction and Industrial Divisions for asphalt and paving equipment and material-handling machinery, and the renewal of another distributor contract.

Parmenter & Andre, 200 Ionia Ave., N. W., Grand Rapids, Mich., has been appointed distributor for the Industrial Division in western Michigan, and Carroll-Edwards & Co., 6508 Montgomery Road, Cincinnati, Ohio, has been appointed distributor for the Construction and Industrial Divisions in western Ohio and southeastern Indiana.

Brandeis Machinery & Supply Co., Brook & Warnock Sts., Louisville 8, Ky., which has represented Barber-Greene in Kentucky for more than twenty-five years, has had its contract again renewed and will handle sales and service in both the Construction and Industrial Divisions. In addition to its previous territory, this company will serve the two tiers of counties in Indiana bordering the Ohio River.

This year's civilian and military requirements for trucks will be even greater than 1944 total production, according to WPB's new Heavy-Truck Labor Advisory Committee.

TODAY'S

Super-System of Material Handling

FASTER

EASIER

BETTER

BROOKS

for

LOADING

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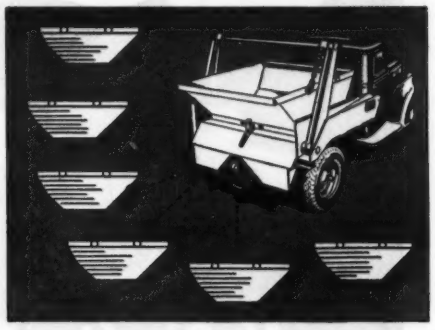
DUMPING

Ask for Catalog #44



LOAD LUGGER

with Detachable Buckets

One Load Lugger mounted on a truck can service from 5 to 10 or more dump buckets . . . hauling them away while workmen are filling the others, conveniently spotted on the job.

This method means lower costs on your contracts . . . saving time, conserving manpower and reducing maintenance expense. It helps beat the truck shortage, because a Load Lugger and set of buckets can handle as much as a fleet of ordinary trucks.

704 Davenport Road, Knoxville 8, Tenn.

Distributors in all Principal Cities

Brooks EQUIPMENT AND MFG. CO.

IT'S AS EASY AS

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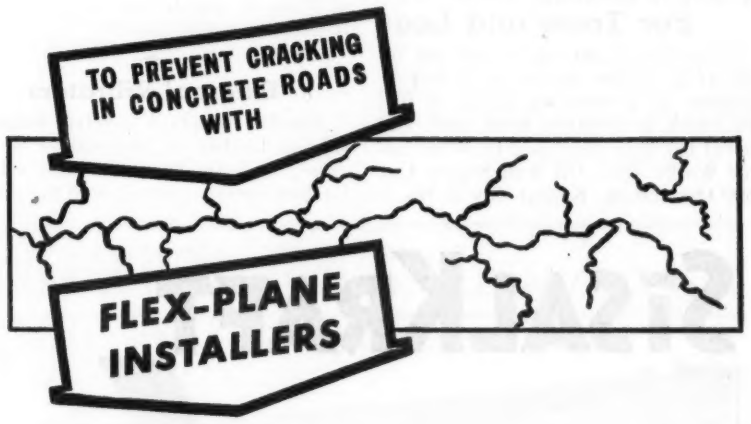


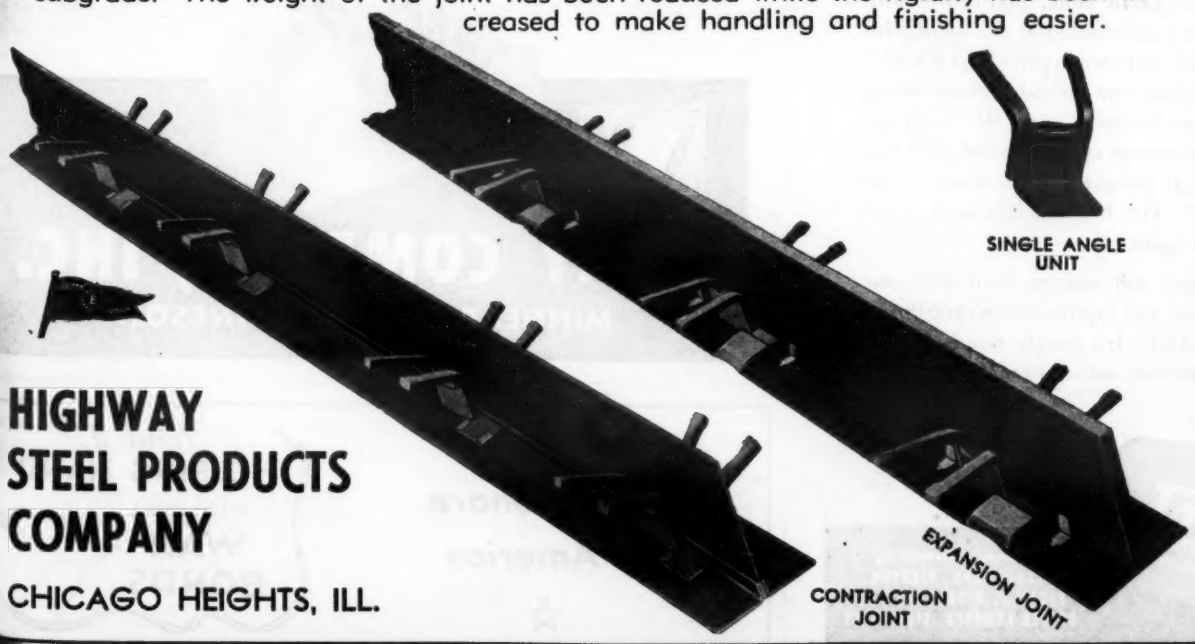
Flex-Plane Dummy Joint Installing Machines are the best means for producing joints in concrete roads. You recall the first concrete roads . . . no joints. Next came the parting strip down the center . . . then the dummy longitudinal and transverse joints widely spaced between expansion joints. Each step reduced cracking; now machine-installed joints, closer spaced, virtually eliminate cracking.

Ask for data and specifications, plus 22 reasons **why Flex-Plane machine-installed Dummy Joints** will make your concrete roads better.

FLEXIBLE ROAD JOINT MACHINE COMPANY

WARREN, OHIO

TRANSLODE Expansion and Contraction Joints have been giving excellent load transfer performance on thousands of miles of American pavements since 1932. Today's improved and simplified design retains the continuous base which makes installation easier and seals the joint against the infiltration of dirt from the soft subgrade. The weight of the joint has been reduced while the rigidity has been increased to make handling and finishing easier.



HIGHWAY STEEL PRODUCTS COMPANY

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GIVE!

Eminent scientists lack funds for experiment . . . cancer clinics are starved for equipment . . . money is needed to care for advanced cases.

Five million dollars a year might cut the deaths from cancer. Might save you, one dear to you. Yet Americans give less than one million dollars. Do your part! Send us anything from 10¢ to $1,000. Every bit helps!

If you are a resident of the Metropolitan area of New York, send your contribution to New York City Cancer Committee, 130 E. 66th St., N.Y. 21, N.Y.

AMERICAN CANCER SOCIETY

350 Fifth Avenue, N.Y. 17 N.Y.

The Witte one-man log and tree saw.

A Self-Feeding Saw For Trees and Logs

A one-man outfit which will cut up logs from a few inches to 5 feet in diameter on a few-cents worth of fuel and which, in addition, feeds itself into the cut has been developed by Witte Engine Works, Div., Oil Well Supply Co., 1600 Oakland St., Kansas City 3, Mo.

The No. 50 combination model is complete with power unit and gives the contractor everything he needs in the way of a saw, from cutting down a tree to buzzing up its branches. It consists of a Witte log and tree saw, the No. 10 branch saw with a 22-inch saw blade, a special pulley, and the belting.

The toggle on this saw duplicates the human-arm swing so that the 5-foot saw blade makes fast strokes, clearing the sawdust at each stroke. The automatic force feed eliminates the need for ropes and other devices on the end of the saw blade.

Complete information on the Witte self-feeding saw, which is powered by a Witte all-purpose engine, will be found in Form 11 which will be sent promptly by the manufacturer.

External Vibrators

Whether standard concrete forms of shiplap lumber or plywood or a concrete-pipe form that you must vibrate for best results, you will find that literature from Electric Tamper & Equipment Co., Ludington, Mich., contains helpful information. Bulletin EX-244 describes Jackson Standard S-type external vibrators, the FV-3 form vibrator, and the SV-4 spud machine, together with the motor attachments for operating them. The Jackson PV-4 and PTV-21A concrete-pipe form vibrators are described in Form PV-244. Form SC 4-642 describes in detail the Jackson vibratory hand screed.

Copies of these bulletins will be sent promptly upon application to the manufacturer and mention of this review.

Guide for Hard-Facing

A 31-page Welder's Guide which describes and illustrates by diagram the process of hard-facing crusher jaws, grader blades, tool bits, churn drills, and similar equipment, to prevent excessive wear and prolong their life, is available for distribution by the Mir-O-Col Alloy Co., 2416-30 East 53rd St., Los Angeles 11, Calif.

Copies of this latest edition of the "Welder's Guide to Successful Hard-Facing" will be sent upon direct request to the company.

SISALKRAFT

BLANKETS SAVE TIME, MANPOWER AND MONEY IN CURING!

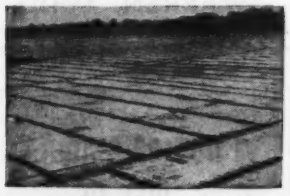
SISAL REENFORCEMENT GIVES STRENGTH AND TEAR RESISTANCE

LOW-COST PROTECTION On ALL Road Jobs!

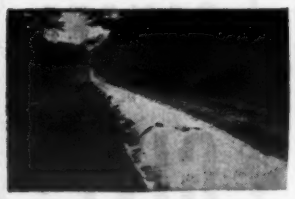
UNMATCHED in their ability to hold moisture within the slab, SISALKRAFT Road Blankets have a time-proven record as the Number One concrete curing agent — producing denser, longer lasting concrete roads at low cost.

Savings in time, manpower and money are effected by the speed with which two men apply SISALKRAFT Blankets over the slab. No sprinkling — no burlap — just "let 'em lay." The concrete cures automatically! The slab is protected from weather and dirt! The blankets are used again and again.

Protect soil cement, road mix, materials and equipment with SISALKRAFT. It's tough, weatherproof, scuffproof, tear-resistant!



PROTECTING SOIL CEMENT



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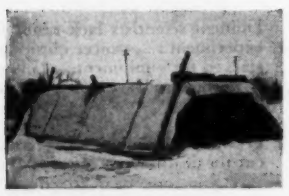

PROTECTS MATERIALS STORED IN THE OPEN

As vital war needs decrease, more and more SISALKRAFT will be available for your use. Victory comes first — and that's the way you want it, we're sure.

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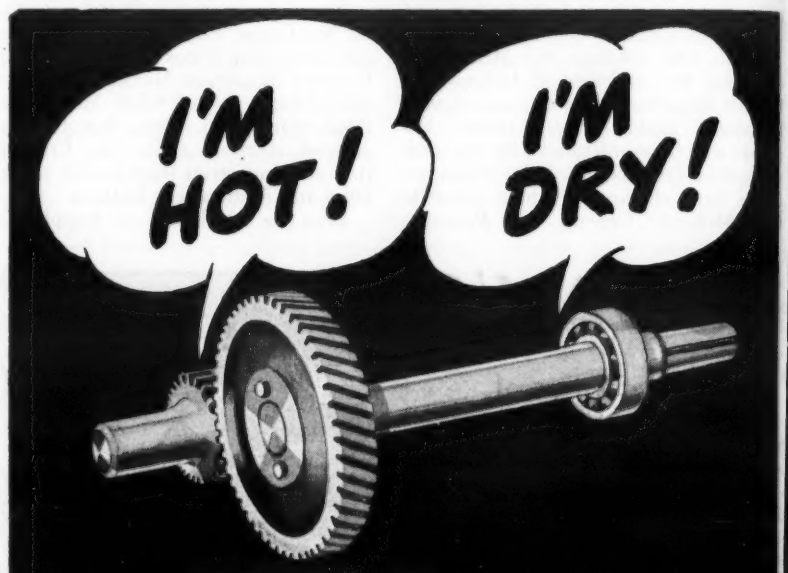
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

Manufacturers of SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

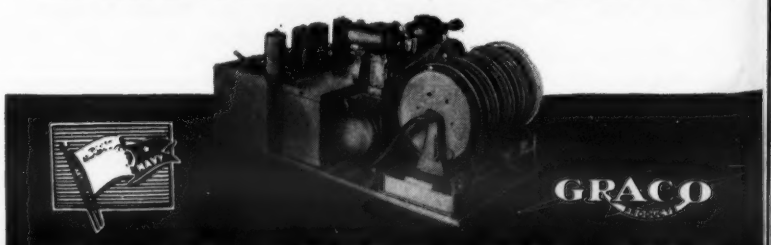


If Shafts, Gears and Bearings could only talk!

● Your machinery always tries to do its work without complaining, but somehow there always comes a time! Give your "ground crew" Graco lubricating equipment and you'll have a lot better chance to keep the wheels flying. Good tools mean a better job of lubricating—less time lost—more production and more profit.

GRACO Convoy Luber—Lubrication is Graco's field. The Convoy Luber is a complete "on the job" unit, ready to serve your equipment anywhere with lubrication, air, light and battery needs. Here's mobile lubrication at its best. Other Graco tools for servicing construction equipment include portable air-operated units, hand operated bucket pump and hand guns for every lubricating purpose.

Keep Machines Fit and Fighting! If your work is essential, you can get what you need to maintain and conserve equipment. Regular pressure lubrication with Graco precision tools means longer life and more work from hard-to-replace parts. Write for Catalog No. 182.



GRAY COMPANY, INC.
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Lend a HELPING HAND with your WAR BONDS

Bituminous Patching In Alameda County

(*Continued from page 1*)

produced its own base gravel, loading from the pit with Hough loaders mounted on Allis-Chalmers M tractors to a 2-inch screen which removed the oversize.

Patching Equipment

For economical patching, the County has constructed, or remodeled, a fleet of units worthy of special description. The principal unit is a Mack truck mounting a steel body of 5-cubic-yard capacity, from which the usual dumping mechanism has been removed. The body is divided by a wooden bulkhead, crossing its center transversely, to haul two classes of material without mixing, and provisions are made for moving this partition and adding a second, if it is desired to haul three gradings simultaneously. Through the bottom of the body and along the left side of it, two 18-inch square holes discharge to two wedge-shaped chutes welded to the steel bottom so as to extend to a point 16 inches above the roadway and outside the truck's left wheels. The taper of the wedges is lateral so that the discharge is parallel to the direction of travel of the truck. Under the discharge openings, horizontal steel plates are suspended to intercept the material when it is desired to apply it by hand shovels to the surface of the road, and they furnish an excellent flat loading surface when this procedure is followed. They may be slid partially or wholly out from under the discharge wedge when it is desired to dump material directly on the road in a windrow. The rate of discharge can be regulated by the gate opening and the speed of the truck.

Since the truck bed does not raise, the space between its longitudinal supports is utilized for a tool box to carry long tools; another box, 24 x 28 inches in size and 5½ feet long, is suspended under the right front of the steel bed and is used for rubber boots, raincoats, lunch-kits, and similar impedimenta; while a third steel box suspended under the right rear of the body provides storage for lanterns, flares, and kerosene. Mounted under the cab is a small DeVilbiss compressor, operated by the driver through a power take-off from the truck engine, which can be utilized to provide additional air for the trailer tank. A ½-inch pipe from the compressor extends out behind the bottom of the truck bed with the male half of a union attached for use when the compressor is operating. Across the front of the steel truck bed is a seat with a back formed by the back of the truck cab, and a protective canopy over it, on which the workmen ride to and from the job.

The trailer portion of the patching unit, known in the organization as a "submarine", is a 350-gallon steel tank mounted on a special chassis which was built in the county shop. This trailer, pulled behind the Mack truck by an A-shaped tongue of steel channels, with a chain added for safety, has under-cut front wheels, thus improving its maneuverability. Under the 350-gallon tank are mounted two 8-cubic-foot air receivers with piping and valves necessary to fill them with air or transfer it from either or both into the top of the larger tank which carries asphalt emulsion. Gages show the air pressure in the receivers and in the asphalt tank at all times. Provisions are made for attaching a flexible line to the union on the line leading from the compressor on the Mack truck if for any reason it becomes necessary to augment the air pressure carried in the air tanks while the unit is away from its base of operations.

Under the emulsion tank a 2½-inch pipe with a valve and strainer discharges

C. & E. M. Photo

One of the Alameda County fleet of bituminous patching outfits consisting of a Mack truck with a special hopper-bottom 5-cubic-yard body and an asphalt "submarine".

the emulsion through a 30-foot length of 1-inch hose with a discharge nozzle and handle at its end. This handle-nozzle is a slightly bent piece of ⅜-inch pipe about 5 feet long, having a connection at one end for the hose and at the other end a standard distributor tip with a sliding valve cut-off. The cut-off is controlled by a rod leading to a lever hinged at the midpoint of the handle so that the operator can easily manipulate the opening and closing of the tip while standing upright. Extended in front of the handle and beyond the nozzle, but so arranged as not to interfere with the spray from it, is a sharpened steel strap, ¼ x ¾ inch, which may be used to probe into the rock or gravel being shot with asphalt, in order to ascertain its penetration.

A transverse step is suspended across the back of the "submarine" and on it is carried a roll of wire-mesh fence 4 x 6 feet in size, which may be opened flat and used as a drag for surfacing material; and across the front of the "submarine" a wooden box 37 x 20 inches in area and 44 inches long provides additional tool storage.

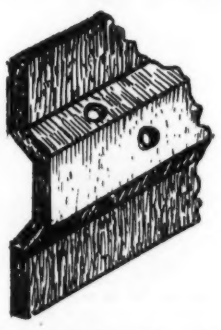
For loading the trailer tank, a connection is provided at the Niles yard where asphalt emulsion may be either pumped into it from the underground storage or loaded through a top port by gravity from an elevated storage tank. At the same time this is being done, the air receivers are filled to 175-pound pressure from the plant compressed-air system which has an outlet adjacent to the emulsion storage.

The entire system for handling emulsion is designed for convenience and economy. A spur track from the Southern Pacific Railroad is situated on the east side of the Niles yard and from the location reserved for the carloads of emulsion a 4-inch buried line carries the emulsion by gravity to a 24,000-gallon-capacity underground concrete tank on the west side of the yard. Just south of

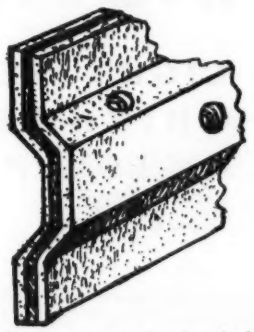
(*Continued on next page*)

SERVICISED: CONTRACTION JOINTS AND DUMMY JOINTS

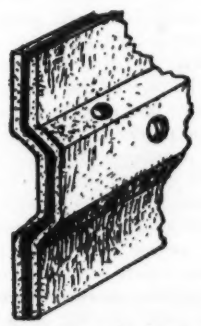
PATENT No. 2,370,153. OTHER PATENTS PENDING.



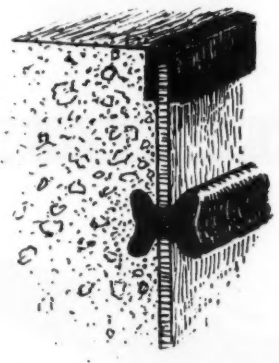
A rigid mastic joint with waterproofing paper sides, punched for dowels and staking. Also prepared with Para-Plastic for better waterproofing of the crevice.



A wood veneer core for interlocking of slabs having felt sides cemented thereto with Para-Plastic which upon oozing will waterproof the top and bottom of the center strip.



Light steel center strip faced on either side with Para-Plastic and felt sides. Sufficient coverage of material to cause slight oozing above and below the plate in order to cause the Para-Plastic to adhere to the walls of the concrete and waterproof the space above and below the joint.



Special keying device formed of Para-Plastic mounted in place by rigid board and capped with Para-Plastic crown.

Para-Plastic
— EXTENDABLE —
MAINTAINS BOND at ZERO
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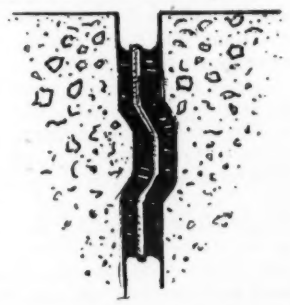
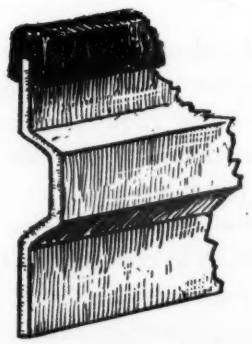
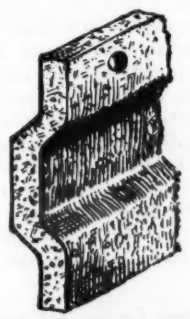


Steel center strip coated with Para-Plastic prior to laying in cement. Absolutely water-proofing the crevice in case of contraction.

Asbestos cement tongue-and-groove strip prepared from the same material from which asbestos shingles are formed. Can be water-proofed or not as desired.



Economical steel center strip having less steel than ordinary. The top ridge having mounted thereon a Para-Plastic crown.



Center strip formed and pressed from sawdust, having synthetic resin binder. Can be water-proofed if desired.

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Alameda County

(*Continued from preceding page*)

the submerged storage tank is a 1,400-gallon steel tank, elevated about 6 feet above the ground. In a small house nearby is a 2½-inch asphalt pump, driven by a 5-hp electric motor, and this pump can deliver emulsion from the submerged tank into the elevated one or directly into the "submarine" or a distributor. The elevated tank provides gravity discharge if for any reason the asphalt pump becomes temporarily inoperative.

After the "submarine" has been loaded with both emulsion and air, the truck starts for the job, stopping en route at a commercial plant to secure a load of the two sizes of chips used for the armor-coat application. One compartment of the truck bed is filled with ⅜ to ¾-inch chips and the second compartment with ¼-inch chips.

Making Small Patches

For small patches, one man, using a wire broom, sweeps the area to be patched, particular attention being given to the edge which is more likely to be coated with dust from the shoulders. As the truck is driven slowly down the road in the direction of traffic, three other men walk alongside and, using long-handled square-edged shovels, take the larger-size chips from the horizontal plate at the bottom of the wedge-shaped discharge chute and broadcast them over the area to be patched. The application is made at a rate of 1 cubic yard of chips per 80 square yards. The truck always travels down the opposite half of the road from that being patched. Uniformity of spread is secured by steel street brooms which are used both with the bristles down, or turned over with the wooden back serving as a lute to spread the chips. Traffic is not stopped but merely slowed down and required to pass the spreading truck on its left side, running over the chips being distributed on that side of the road.

When the chips have been uniformly spread, one man starts the application of emulsion. Using the nozzle on the 30-foot hose he sprays the bitumen in longitudinal strips, 1 foot wide and about 20 feet long, starting at the outer edge of the surface and walking slowly back and forth as he makes the application to adjacent strips until the center stripe is reached.

The air stored at 175-pound pressure in the air receivers under the emulsion tank is valved into the tightly closed tank of emulsion and furnishes sufficient pressure for its complete discharge through the hose and nozzle. If leaks or accidents should cause the loss of some of the air, so that there is not enough to discharge the entire 350 gallons, the small compressor on the Mack truck is used to produce additional pressure. When the application of the emulsion is completed at a rate of approximately 0.33 gallon per square yard, the smaller chips are applied, using the same methods as for the first application except that the rate is reduced so that a cubic yard of small chips covers 120 yards of surface. The entire patch is rolled by a LeRoi-powered C. H. & E. 3-ton tandem roller.

Making Large Patches

A variation of this method is used on more extensive patches. In this operation, the sliding horizontal plate under the discharge of the larger-chip bin is adjusted so that the discharge falls past it and directly onto the road. The truck is driven slowly along in a line which will discharge this windrow on the quarter-point of the width of the road, the size of the windrow deposited being regulated by the gate opening and the truck speed to give the proper amount of chips. The truck driver then makes a similar trip on another line which deposits a windrow of the smaller chips just across the center stripe from the half width being patched. The truck driver then makes a trip back to the commercial plant to secure another load of both sizes of chips while the men of the crew spread the windrow of larger chips uniformly across one half of the road. While the truck is gone, the emulsion trailer is handled by the foreman's pick-up truck, the emulsion applied to the larger chips, then the windrow of the smaller-size chips is spread and the patch rolled.

C. & E. M. Photo

Spraying emulsion from a "submarine" on top of freshly spread chips in Alameda County.

When patching comparatively undamaged sections of surfacing, which is the procedure usually followed, only one application of emulsion is made, on top of the first spread of larger chips. In the rare cases when serious deterioration has occurred, however, so that the base material is exposed, a preliminary application of emulsion, at the rate of 0.33 gallon per square yard, is made to the base, with a second application at the same rate between the two courses of chips.

Small pot-holes are usually patched with a plant-mix of MC-3 secured from commercial plants. When this is not available, they can be satisfactorily patched by the same penetration method used for larger patches, although the cost per square yard is of course increased tremendously by the smaller

(*Continued on next page*)

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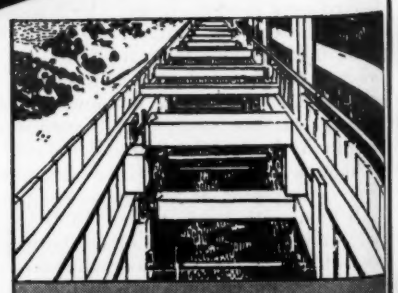

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Alameda County

(*Continued from preceding page*)

areas involved.

The usual crew for a patching unit consists of a truck driver and roller operator, both of whom aid in the spreading and brooming if their other duties do not occupy their entire time, a foreman, and three laborers who spread the chips and apply the emulsion.

Surfacing Methods

For the surfacing operations occasionally conducted by county forces when it is impossible to contract the work, Alameda County has a 1,200-gallon Spears-Wells distributor on a Moreland truck, and a 660-gallon shop-built distributor. When work of this type is performed, the chips are spread by a spreader box attached to the rear of the dump trucks, broomed by power brooms, and rolled by two 5 to 6-ton Buffalo-Springfield tandem rollers.

Center Striping

While many counties, and not a few states, have found it advisable to reduce center-striping operations materially during the war because of the paint scarcity, Alameda County has considered it undesirable to practice this reduction because of the prevalence at certain times of the year of heavy fogs which render driving both dangerous and difficult. Since most of the county roads are surfaced for a width of only 20 feet, with an additional foot of the shoulders oiled to protect the edges of the surfacing, the clearance is not great, and a distinctly marked center stripe is a necessary safety measure. Therefore Alameda County's striping machine painted 200 miles of stripe during 1944. White paint is used, with Prismo beads added in varying proportions on some of the more heavily traveled routes.

For the application of this stripe, John D. Galvin, County Equipment Superintendent, has designed a rather unusual machine, which was assembled in the county shop at Niles. The frame is made of 5-inch channels cross-braced for rigidity. Both front and rear axles came from old Chevrolet cars and the steering gear from an old Walker electric truck. The driver, seated at the extreme front end, maintains his direction by sighting over an indicator set on a 12-foot rod extending ahead of the machine down the existing center stripe or the markings established in advance for a new one. Immediately behind the driver a Ford Model A engine is mounted with a fuel tank above it. This engine drives a Model 225 DeVilbiss compressor mounted on the right and a ½-inch paint-circulating pump, mounted behind, through sprockets and chains controlled by a Ford truck transmission. The drive shaft goes to a second Ford transmission, operated by the man on the rear of the machine, and by properly combining the gears in both transmissions, any desired road speed, in relation to proper speed for paint pump and compressor, may be obtained. A 55-gallon oil drum is mounted behind the engine to hold the paint.

A pipe for paint goes directly from the pump to a DeVilbiss W. V. spray gun. Uniform air pressure is assured by the use of an air receiver, made of 6 feet of 6-inch pipe mounted under the frame on its left side, charged by the continuously running compressor and discharging into two air lines to the spray gun. One line supplies the air for atomizing the paint which discharges continuously through the gun nozzle; the other line supplies the air to actuate the air piston causing the paint needle valve to open and close. This line can be valved off and the air delivered through another line along the left of the frame in which a three-way valve admits air to the gun piston and releases it at predetermined intervals when a broken line is being sprayed. This valve is operated by a cam turning on an axle protruding from the frame in front of the left rear wheel. When painting the

(*Concluded on next page*)

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The Evercrete Corp., manufacturer of protective and decorative coatings for masonry surfaces, has announced new headquarters, on May 1, at 424 West 42nd St., New York 18, N. Y., to be known as the Evercrete Building. In its new location the company offers a free service of technical advice on the protection and maintenance of masonry surfaces.

Engineers, highway officials or others who wish to consult this service should write direct to the Technical Department of the company and mention CONTRACTORS AND ENGINEERS MONTHLY.

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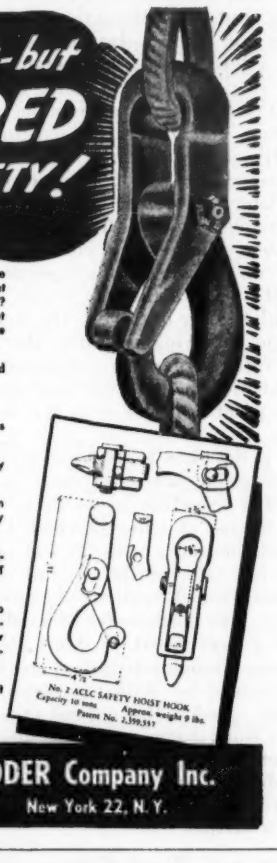

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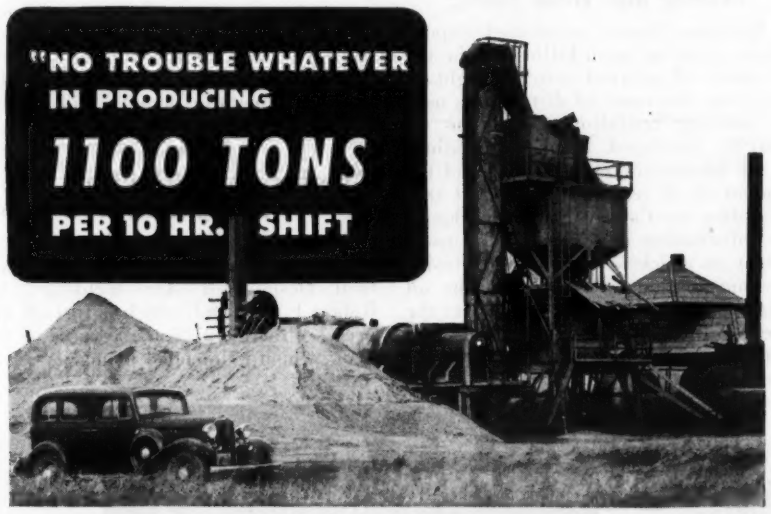

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Alameda County

(*Continued from preceding page*)

3-inch broken line with 15-foot stripes and 25-foot gaps, now used in Alameda County, the air goes to the nozzle continuously, while the paint is alternately delivered or shut off by the action of the valve. The cam can be advanced or retarded by a lever from the operator's seat on the rear so that the opening and closing will occur at the precise moment needed when repainting an existing broken stripe. The nozzle is mounted on a transverse rod with a hand lever providing lateral movement along it to permit swinging slightly off the center of travel when going around curves. A tell-tale arrow visible to the operator shows at all times whether the nozzle is centered with the line of travel. On each side of the nozzle, swinging plates, which move in a vertical plane to compensate for irregularities in the road surface, confine the paint application to the desired width.

Pre-war policy was to paint a solid 4-inch white stripe but paint shortages have caused a reduction in width to 3 inches and the use of a line in which 15 feet of paint alternates with 25 feet of gap. This has reduced the amount of paint required from 12 gallons per mile to about 3½. The machine is ordinarily operated at a road speed of about 2½ miles per hour, though satisfactory work can be performed by skilled operators at twice that speed. The normal crew consists of a truck driver, paint machine driver, paint machine nozzle operator, and two laborers, when repainting an existing stripe, or four to six when painting new stripes.

Mowing and Weed Killing

Alameda County conducted experiments in spring weed killing by the use of diesel oil sprayed onto the right-of-way from the same oil distributors used in patching operations, until the oil scarcity interfered. Large variations in the success of the treatment and the amount of oil required were noted and, according to County Surveyor Boggs, the information now available is insufficient on which to base any conclusive recommendations. When used, the oil was applied early in the spring and the weeds, killed by the application, were burned standing as soon as dry enough. This of course had to be performed while weeds and grass off the right-of-way were green and not inflammable, was complicated by the presence of shade trees, and worried property owners in some locations. During the past year, the two Toro mowers owned by the County have handled all mowing considered essential and no further attempt has been made to use oil for weed killing. Mr. Boggs feels, however, that the method is worthy of further investigation and study when oil again becomes plentiful.

Personnel

Wallace B. Boggs, Alameda County Surveyor, is in charge of all county highway activities, assisted by Chief Assistant Engineer W. E. Yocom. G. G. Gale and Harry Schreiber are Maintenance Engineers in charge of this phase of the work.

Mandt Made President Of Jaeger Machine Co.

O. G. Mandt, who for the past seventeen years has been Vice President and General Manager of The Jaeger Machine Co., Columbus, Ohio, was recently made President of that organization. Gebhard Jaeger, former President, was elected Chairman of the Board, and R. McLean was named First Vice President in charge of sales.

The Jaeger Machine Co. entered the construction industry in 1906 as a manufacturer of tilting concrete mixers and has expanded its products to become one of the largest manufacturers of contractors' pumps, various types of mixers, truck mixers, and concrete spreading and finishing machines. During the war it has engaged in the large-scale production of invasion-ship winches, air compressors, and material loaders and cranes for war needs. These latter lines, which were introduced to over 700 Jaeger distributors, highway officials, and contractors at an exhibit held in the company's plant in January, will be continued for civilian use after the war.

One Hundred Welding Designs in New Book

There are one hundred illustrations of welding designs in Volume II of "Practical Design for Arc Welding", by Robert E. Kinkead, which is just off the press. Practicality is the keynote of the book, which is intended primarily as an idea stimulator for designers, engineers and fabricators, to assist them in making the most of their welding equipment. The designs illustrated and described have particular reference to the fabrication of tubular members and connections, although many will be found applicable both to piping installations and to tubular structural design.

Copies of this cloth-bound 8¾ x 11½ inch book may be secured from Hobart Brothers Co., Hobart Square, Troy, Ohio, at a cost of $3.50 each. Because of paper restrictions, the edition is limited, so it is suggested that orders be sent early.

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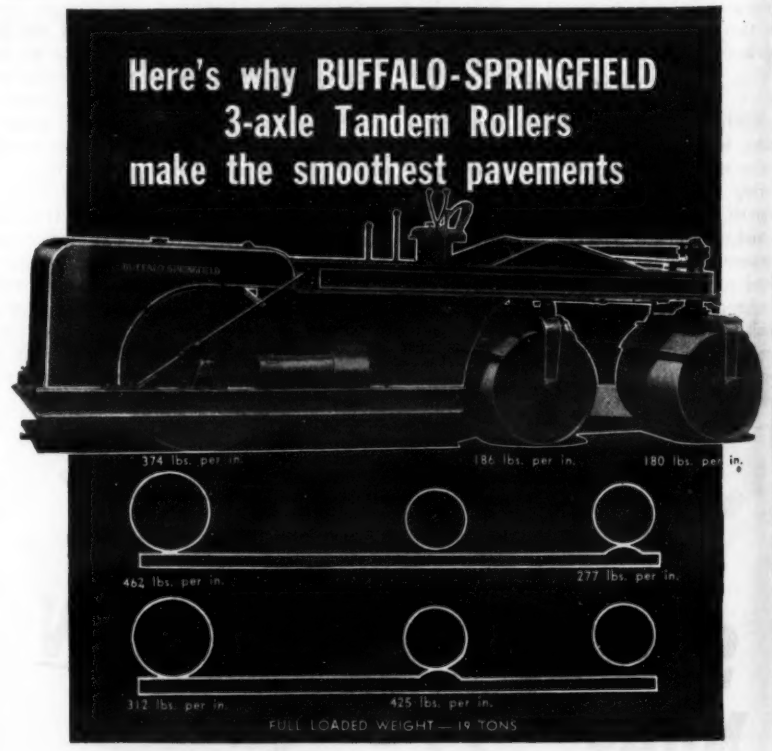
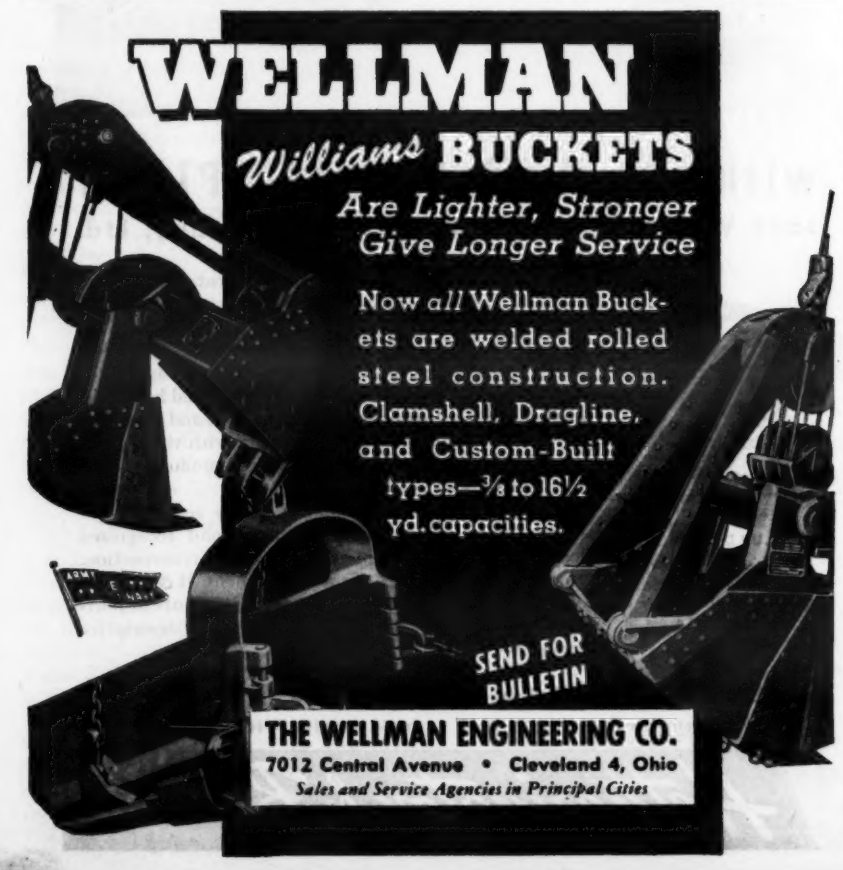

Here's why BUFFALO-SPRINGFIELD
3-axle Tandem Rollers
make the smoothest pavements
374 lbs. per in.
186 lbs. per in.
180 lbs. per in.
462 lbs. per in.
277 lbs. per in.
312 lbs. per in.
425 lbs. per in.
FULL LOADED WEIGHT — 19 TONS

ALL THREE ROLLS are on the same plane so that when any of them encounters a high spot, extra weight is automatically transferred from the others to provide higher compression. Because of the large diameter of all three rolls and the vertical application of the weight, the high spots are rolled down rather than pushed ahead upsetting the bond of the material. The result is higher density and smoother pavements. Much corrective and cross-rolling are eliminated so that many owners report their 3-axle tandems are doing the work of two standard machines. Be sure you have all these advantages when you are bidding on large postwar paving jobs. Remember that building the best rollers is our only business. That's why Buffalo-Springfield Rollers are preferred by the road building industry.

THE BUFFALO-SPRINGFIELD ROLLER COMPANY Springfield, Ohio

The Oldest & Largest Builder of Road Rolling Equipment in America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Williams BUCKETS
Are Lighter, Stronger
Give Longer Service
Now all Wellman Buckets are welded rolled steel construction. Clamshell, Dragline, and Custom-Built types—⅜ to 16½ yd. capacities.
SEND FOR BULLETIN
THE WELLMAN ENGINEERING CO.
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Sales and Service Agencies in Principal Cities

Cold-Mix Top Laid On New Stone Base

Sangamon County, Illinois, Reconstructs 1.4 Miles Of County Highway System By Contract

+ A SHORT but important section of a county highway was improved last autumn about 3 miles northeast of Springfield, Ill., when 1.4 miles of an old gravel road, known as the St. John's Sanitarium Road, was reconstructed as part of the highway system of Sangamon County. The improvement, which was done under low-bid contract by the Sangamo Construction Co. of Springfield, consisted of laying a 6-inch layer of crushed stone as a base for a 2-inch surface course of bituminous dense-graded-aggregate machine-mix known as Sub-Class C-6 in the Illinois Division of Highways specifications.

Work was begun the latter part of September and by the middle of November the road was open to traffic. The original 20-foot gravel road had received some bituminous-penetration treatments in its twelve years of service and was used as a foundation for the new construction.

Crushed-Stone Base Course

Crushed stone for the base course was purchased from the East St. Louis Stone Co., located in the city of the same name 90 miles southwest of Springfield, and was transported in railroad gondola cars to the contractor's plant in Springfield. Here a Northwest crane with a 40-foot boom and a Blaw-Knox 1¼-yard clamshell bucket unloaded the stone into a fleet of seven trucks, mostly Fords and Dodges, with average capacities of 6 tons. This base-course crushed stone was graded from a maximum 1-inch stone down to fines to give a dense base when compacted by rolling. The haul from the railroad siding to the center of the job was about 1½ miles and the trucks end-dumped the crushed stone at intervals along the center of the road as directed by the foreman.

An Austin-Western 99M power grader then bladed the material evenly over the old 6-inch gravel road in layers approximately 2½ inches thick and 22 feet wide. The crushed stone was put down in courses so that the compacted total depth measured 6 inches. Each course was rolled first by a Farmall rubber-tired tractor pulling a 6-ton wobble-wheel rubber-tire roller, and then by a 5-ton 4-wheel steel roller. The crushed stone was kept wet as an aid to compaction by sprinkling from a 500-gallon water tank with a 10-foot spray bar mounted on an International truck. Traffic was permitted over the road in this stage of construction to assist in compaction. A total of 5,089 tons of crushed stone was used in laying the base course.

Bituminous Materials

When thoroughly dried and compacted, the crushed-stone base course was primed with 6,142 gallons of MC-1 asphalt applied by a pressure distributor at the rate of 0.3 gallon to the square yard. A couple of days was allowed for the prime to penetrate the base and cure, after which the C-6 course was laid.

This surface course consists of a 2-inch layer, 20 feet wide, of densely graded crushed-stone aggregate which was plant-mixed at the contractor's asphalt plant in Springfield with MC-5 asphalt at the rate of 10 gallons to a ton of aggregate. About 1,800 tons of bituminous plant-mix was used on this contract, being laid by a mechanical spreader and then rolled. The crushed stone used in the C-6 mix met the following grading specifications:

C. & E. M. Photo
The base-course parade on a Sangamon County, Ill., contract; the grader spreads, then the rubber-tire and steel-wheel rollers compact the gravel for a 2-inch plant-mixed bituminous top.

Passing	Per Cent
1-inch sieve	100
¾-inch sieve	95-100
½-inch sieve	70-90
No. 4 sieve	45-65
No. 10 sieve	40-55

The surface was sealed with 4,785 gallons of MC-5 asphalt applied by a pressure distributor at the rate of 0.35 gallon to the square yard, and then covered with stone chips distributed by a mechanical spreader at the rate of 20 pounds to the square yard. After the surface was rolled, the road, which had been closed during the bituminous operations, was opened to traffic.

Personnel

The total cost of this county road project was $35,000. It was built under the direction of E. E. Young, Resident Engineer for Sangamon County, of which Ray V. Tilly is Highway Superintendent. William H. Kewley, a member of the firm of the Sangamo Construction Co., was in charge of the project, and Paul L. Degner supervised field operations for the contractor.

Gilbert H. Gaus Heads Gardner-Denver Branch

The Gardner-Denver Co., of Quincy, Ill., manufacturer of pumps, hoists, drills, and kindred equipment, has appointed Gilbert H. Gaus as Manager of its New York branch office, at 76 Ninth Ave., succeeding G. V. Leece, Vice President, who now heads the Export Division.

Mr. Gaus has been a sales engineer in the New York office since joining the company in 1938, and previously had had eighteen years' experience in engineering and sales in that area, handling pumps and other mechanical and electrical equipment for industrial plants, power plants, water works, and sewage plants.

"OUTLAW" ROAD SURFACE BREAKUPS

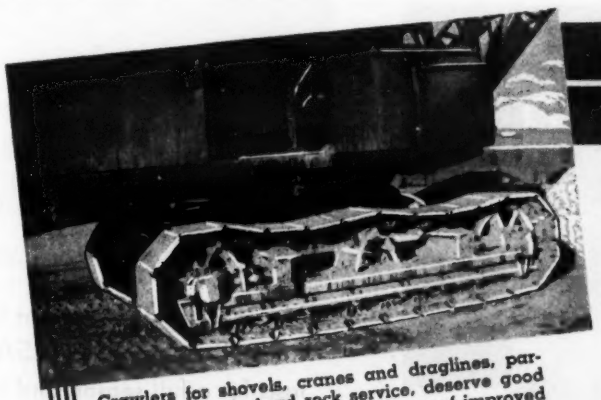
This state's highway subdrainage program was speeded and simplified by use of long lengths of sturdy, flexible perforated pipe.

Until 1940, pavement breakups were as "reg'lar as groundhog day" each spring on certain Connecticut highways. Then state engineers went into action with a thorough subdrainage program. Today that work is paying off in firm, smooth pavements, less maintenance work, reduced costs. A vital factor was—and is—perforated metal pipe that intercepts ground water in the trouble spots. They keep pavement foundations stable and firm.

You can "outlaw" costly breakups the same way with ARMCO Perforated Pipe. Installation is easy and fast, and costs are low—thanks to the long pipe lengths, fewer joints, light weight, and freedom from breakage. Once in the ground, ARMCO Perforated Pipe has the flexible strength needed to resist traffic weight and impact, vibration and disjointing. Perforations instead of open joints reduce the hazards of clogging.

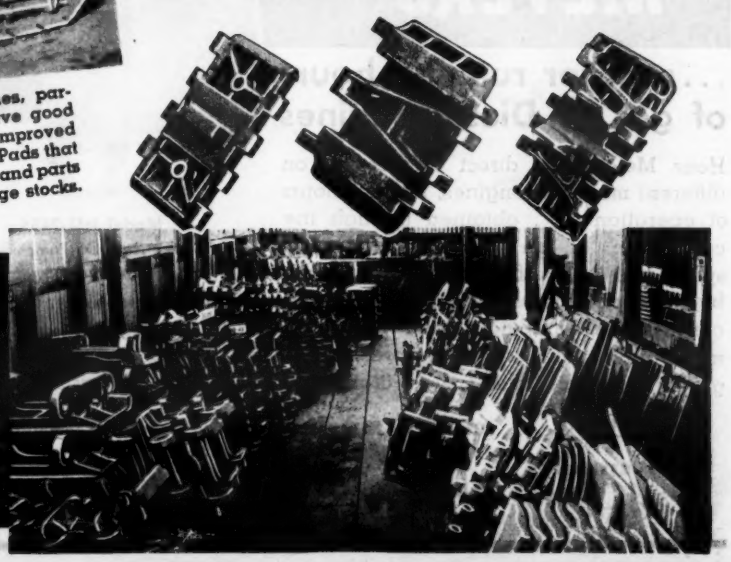
Remember that good drainage is costly only when omitted. Write us for literature on Designed Subdrainage. Armco Drainage Products Association, 425 Curtis Street, Middletown, Ohio.

ARMCO Perforated Pipe



THOSE BIG BABIES NEED TOUGH SHOES

Crawlers for shovels, cranes and draglines, particularly those in hard rock service, deserve good shoes. Our specialty is crawler shoes of improved reinforced design and toughened steel . . . Pads that outwear and outlast . . . reducing idle hours and parts costs . . . substantial savings for you! Large stocks.



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Manufacturers of TRACK SHOES, CRUSHER JAWS and other WEARING PARTS • PACIFIC JAW CRUSHERS • SLUSHING SCRAPERS • SHEAVE BLOCKS • PACIFIC ROCK BIT GRINDERS • HAND WINCHES • DRILL ROD Service

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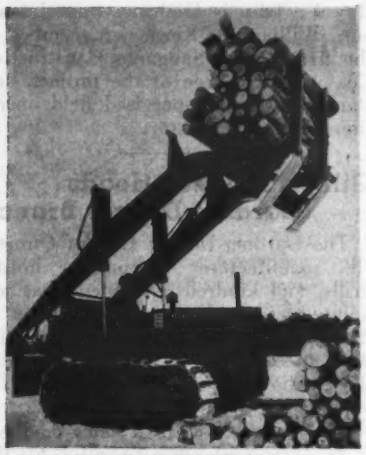


The Drott Skid-Loader.

Labor, Contractors, Papermakers Benefit

A new manpower-aid, 1945 term for labor-saver, has been announced by Hi-Way Service Corp., 3841 W. Wisconsin Ave., Milwaukee 8, Wis. This Drott Skid-Loader is a tractor-mounted device for loading one cord of pulpwood at a bite from a pile into a truck in 1½ minutes, a job that would take 25 men to accomplish in the same length of time. Contractors who are looking for new outlets for their organizations can equip tractors with this new loader and be of inestimable service to the paper industry of America in its tremendous war job, by aiding in getting out more pulpwood with fewer men.

For full details about this new loader, write to the manufacturer and mention this news story.

N. Y. Wants to Plow Own State Highways

Under the plan which Charles H. Sells, State Superintendent of Public Works, has placed before Governor Thomas E. Dewey of New York, New York State counties, two years after the war ends, would no longer be called upon to plow the snow from state highways in winter for a stated price per mile, no matter how much snow may fall.

New York now sands its icy pavements at a cost of about $2,000,000 a year, but pays the sixty-two counties a total of $800,000 a year for plowing the state highways, or about one-half the actual cost to the counties.

Mr. Sells shows the following present-day costs for ice control and snow plowing:

State cost for ice control	$2,000,000
State costs for reimbursements to counties under the present law, representing 50 per cent of the county expenditure up to $75 per mile	800,000
County costs on the other 50 per cent of this same cost	800,000
	$3,600,000

In addition to this, there are incurred for these purposes by very many counties substantial costs which are not reimbursable by the State. The costs are difficult to estimate. During the winter of 1943-44, according to Mr. Sells, the actual cost in this particular category was very light because of the light snowfall through the state. In the winter of 1942-43, where heavy snowfall was encountered, the counties spent approximately $400,000 in excess of the 100 per cent, of which the State paid half.

The complaint of the counties up to the present time has been that the amount of state reimbursements, namely 50 per cent of the costs not exceeding $75 per mile, is entirely inadequate and in no way approaches a fair scheme of reimbursements. The State estimate of $3,600,000, as shown above, for the entire work of removing snow and controlling ice under state auspices, therefore, really contemplates a saving over the amount spent at present and, in addition, it is believed, will result in improved conditions.

Superintendent Sells points out that, under the plan as proposed, it would be possible for localities to continue the actual work of removal with their own forces and equipment under 100 per cent reimbursement by the State. It would also be possible for the municipalities which do not care to proceed in this manner to permit actual snow removal by State-owned equipment and personnel.

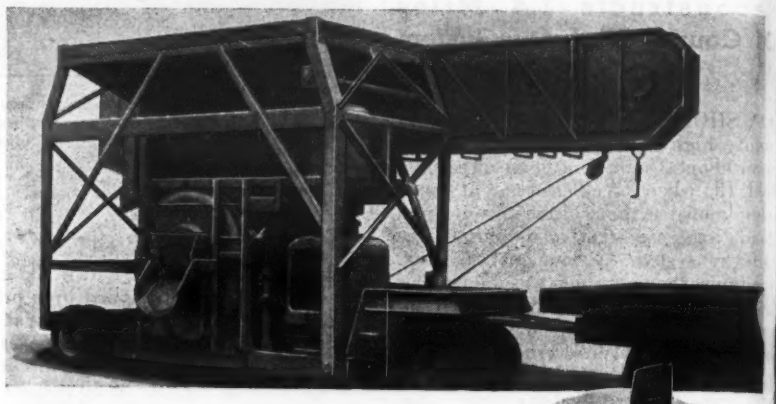
Superintendent Sells states, "It must be realized that in looking ahead we are planning much more intensive attention to this detail of highway maintenance, and we hope that the standards to be maintained in the proposed operation will be substantially higher than they are at present".

Pneumatic-Tool Folder

Representative models of the complete Ingersoll-Rand line of air tools and portable compressors are described and illustrated in a pocket-size folder entitled "Air-Operated Tools for Maintenance, Construction and Demolition". Air tools such as paving breakers, Jackhamers, and pile drivers are included, as well as hose couplings, an air-line lubricator which can be used on many kinds of air-operated tools, drills and reamers, drill bits, wood borers, concrete vibrators, and other tools for all kinds of construction and repair work.

Copies of the folder may be secured by writing to the Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., and mentioning this publication.

More than 6,500,000 persons make their peacetime living directly or indirectly out of highway transportation.



ERIE *Strayer* PORTABLE CONCRETE PLANT combines in one portable unit—2 or 3 compartment storage bin—bucket elevator—AggreMeter unit to weigh batch in 15 seconds—water tank and proportionater—batching meter—pre-mixing cement feeder. Available on priority in 3 sizes. Write for booklet.

ERIE STEEL CONSTRUCTION CO.
ERIE, PENNSYLVANIA
Aggre Meters • Buckets • Concrete Plants • Traveling Cranes

MECHANICS Roller Bearing UNIVERSAL JOINTS
Require Only Once-a-Season Lubrication
Even When They Constantly Work in Dirt

No need to take frequent time out to lubricate MECHANICS Roller Bearing UNIVERSAL JOINTS. One shot of lubricant lasts for a full season and is air-tight sealed in — keeping out all moisture and dirt. Let our engineers show you how this and other advantages of MECHANICS Roller Bearing UNIVERSAL JOINTS will improve the efficiency and reliability of your trucks, tractors, earthmovers or other road-building equipment.

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BORG-WARNER CORPORATION 2026 Harrison Avenue Rockford, Illinois

MECHANICS *Roller Bearing* UNIVERSAL JOINTS ARE SERVING IN

PRODUCTIMETER HOUR METERS

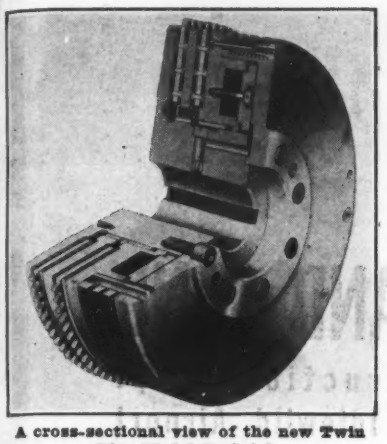
...register running hours of gas or Diesel engines

Model HM-7405
Driven from Oil Pump Gear

Hour Meters, for direct application on different makes of engines, register hours of operation . . . obtained through the conversion of an average crankshaft speed into hours of running time. Readings thus obtained are invaluable to owners and operators of motorized construction equipment, and provide a basis for highest efficiency maintenance and service records. Use them on compressors, mixers, graders, tractors, bull dozers, crushers, pavers, road rollers.

Compact... easily adaptable... send for complete details in Hour Meter Catalog No. 20

DURANT MANUFACTURING COMPANY
1976 N. Buffum St., Milwaukee, Wis.



A cross-sectional view of the new Twin Disc Model P clutch.

Air-Actuated Clutch For Heavy-Duty Work

A new air-actuated clutch, ideal for remote-control set-ups and where "feather-touch" engagements in heavy-duty operations are necessary, is described in an 8-page engineering bulletin, No. 139, recently issued by the Twin Disc Clutch Co., manufacturer of industrial clutches and hydraulic drives, Racine, Wis.

The new clutch is known as the Twin Disc Model P air-actuated clutch. It retains many of the features of the familiar heavy-duty Twin Disc Model E friction clutch and may be used in many of the same types of installations as the latter. The new model has a hub and back plate, center plate, floating plate, and friction discs of essentially the same proportions as the earlier friction model, and is manufactured in a wide range of sizes, from 14 to 36-inch, and capacities from 65 to 895 hp.

The air-actuated clutch operates by remote control without a complicated linkage system, and shaft space is greatly reduced. Almost any amount of air pressure, within limits, can be applied to this friction plate to provide either slow or fast engagements, and it has few moving parts.

The Model P design provides two different methods for handling the actuating air supply, depending upon where the clutch is mounted: first, by drilling the shaft and using an end shaft rotary air seal; second, by using a special shaft-a-round or mid-shaft rotary air seal.

Copies of Bulletin No. 139 may be secured direct from the manufacturer.

Extending Equipment Life By the Use of Hard-Facing

"Stoody Specification Sheets", a 40-page catalog published by Stoody Co., 1136 W. Slauson Ave., Whittier, Calif., have been compiled by Stoody hard-facing engineers from the contributions and experience of dozens of contracting companies. "Specification Sheets" show actual salvaging methods now employed on various pieces of earth-working equipment for obtaining several times more life from parts by simple welding procedures. All examples have been proved in actual practice before being accepted. Each sheet is devoted to the proper method of reclaiming specific parts, such as tractor rollers, bulldozer end plates, crusher jaws, power-shovel equipment, etc. Large illustrations show the proper appearance of hard-faced parts and location of correct Stoody hard-facing alloy. Information includes a list of the material required, the best welding procedure, and the usual increase in life obtained by hard-facing.

Copies of "Specification Sheets" may be obtained free by writing direct to Stoody and mentioning this review.

Homestead Opens New Cleaning-Compound Plant

Cleaning compounds for use with Hypressure Jennys and other steam spray-cleaners are now being produced at the Homestead Valve Mfg. Co.'s new plant at Edgeworth, Pa. The main plant, for the manufacture of the cleaning equipment itself, is located at Coraopolis, Pa. In addition to compounds for spray-cleaning, the new plant will also produce compounds for use with dip tanks, soaker tanks, and other methods of machinery cleaning in industry.

Because of its greater capacity and its location on the main line of the Pennsylvania Railroad, the new plant will facilitate speedier delivery of Homestead cleaning compounds than has been possible heretofore.

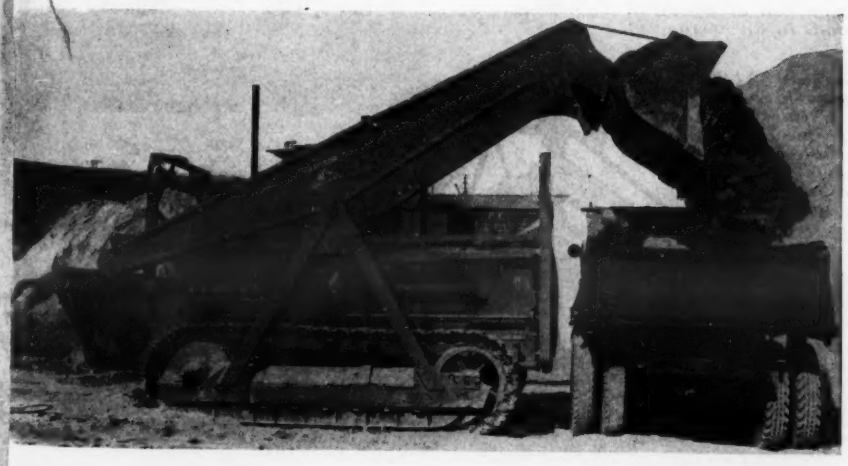
REINFORCING STEEL —
THE REAL STRENGTH OF CONCRETE CONSTRUCTION

LACLEDE

AVAILABLE NOW IN BILLET OR RAIL STEEL GRADE—STRAIGHT OR FABRICATED

LACLEDE STEEL COMPANY
ST. LOUIS, MISSOURI

McCAFFREY TRACTOR SHOVEL



- 1½-yard capacity bucket.
- 100% cable control of bucket.
- Weight centered on truck frame.
- Design permits bucket to reach over center of the truck.

For sizes and specifications of this unit write to:

M. P. McCAFFREY INC.
2121 EAST 25TH STREET
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Contractors and Engineers Monthly

13 TOURNAPULLS LICK LONG ISLAND SAND

For Circle Construction Corp. On New York City Idlewild Airport

Circle Construction Corporation has assigned the toughest 2,000,000 cu. yds. of their 2,500,000-yard Idlewild Airport contract to their LeTourneau fleet, including 13 Super C Tournapulls. Conditions are severe. Sand ranges from saturated, ocean-dredged material to extremely dry, loose footing that bogged down ordinary rubber-tired equipment.

Under these extreme conditions the big rubber-tired Tournapulls, with their 12 pay yard Scraper loads, show an over-all operating efficiency from 85 to 90%. This, in spite of loose sand, so tough in some places that the Tournapulls are occasionally pushed off the fill to keep these rigs in production where other hauling units failed to get through.

Big 5'6" diameter tires, 21" wide, provide ample flotation. Two-wheel design, concentrating full weight of the prime mover and 40% of the Scraper and its load on the front drive tires, gives maximum traction . . . proved Tournapulls to be the answer on this tough Long Island sand job.

You'll Make More Money with Tournapulls

Like Circle Construction Corporation, and scores of other leading contractors, you'll find, too, that fast-moving, rubber-tired Tournapulls will give you higher average speed to move more yardage at lower costs on a wide range of conditions. It will pay you to check NOW on Tournapull performance, when figuring your airport, roadwork, dam, levee, stripping and other earth construction jobs. See your local LeTourneau distributor about the profit possibilities TODAY.

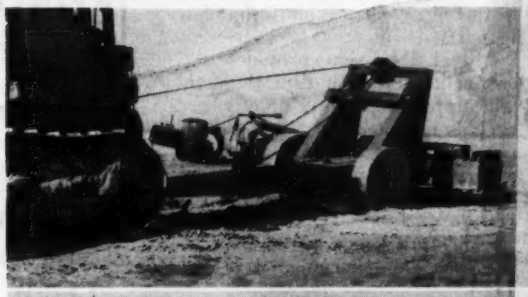
Time Studies

Working in dredged ocean sand, TOURNAPULLS show overall efficiency performance of 85 to 90% on both medium and long hauls:

Round Trip Haul	5200'	7200'	8400'
Average Loads per Hour	7.0	5.8	5.5
Pay Yards per Trip	12	12	12
Pay Yards Per Hour	84	69.6	66
Pay Yards per 10 Hours	840	696	660

In this difficult dredged Long Island sand, Tournapulls often heap full loads in only 45 seconds, average less than a minute for loading. Engineers' fill measurements show Tournapull loads check out slightly over 12 yards pay dirt.

When dredged ocean sand froze, Circle Construction Company broke it up with a LeTourneau Rooter and moved it with their Tournapulls to keep the job on schedule during winter months.



Big 5'6" tires, 21" wide, kept the Tournapulls rolling on top of the sand fill to spread their loads in an average of one minute.

Quick acceleration into 14.9 m.p.h. speed gave remarkably high percentage of Tournapull travel time in high gear to deliver big yardages over varying haul lengths (see time studies). This, in spite of both extremely wet and dry hauling conditions.

LETOURNEAU — PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

JOB-PROVED — Over 2200 BUILT & SHIPPED

TOURNAPULLS

Trade Mark Reg. U.S. Pat. Off.

RUBBER-TIRED POWER FOR FASTER EARTHMOVING

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